

MACRO

THE 6502 JOURNAL



In the Heart of Applesoft

Increase KIM-1 Versatility at Low Cost

An Atari Assembler

A Simple Securities Manager for the Apple

PET String Flip

A C1P Sound Idea

NOW THE SOFTCARD™ CAN TAKE YOU BEYOND THE BASICS.



You probably know about the SoftCard—our ingenious circuit card that converts an Apple II® into a Z-80® machine running CP/M®.

You may even know that with the SoftCard, you get Microsoft's powerful BASIC—extended to support Apple graphics and many other features.

Now, whenever you're ready to get beyond the BASICs, the SoftCard can take you into whole new realms. Starting with two advanced language packages from Microsoft.

FORTRAN AND COBOL TO GO.

Now you can run the world's most popular engineering/scientific language and the most popular business language on your Apple. Think what that means: you can choose from literally thousands of "off-the-shelf" applications programs, and have them working with little conversion. Or design your own programs, taking advantage of all the problem-solving power these specialized languages give you.

FORTRAN-80

A complete ANSI-standard FORTRAN (except COMPLEX type), with important enhancements. The extremely fast compiler performs extensive code

optimization, and, since it doesn't require a "P-code" interpreter at run time, your programs will typically execute 2-3 times faster than with Apple FORTRAN.

FORTRAN is easy to learn if you know BASIC, and the package includes a huge library of floating point, math, and I/O routines you can use in all your programs.

COBOL-80

Virtually the only choice for serious business data processing. It's ANSI 1974 standard COBOL, with many user-oriented features added: formatted screen support for CRT terminals, simple segmenting of very large programs, powerful file handling capability, trace debugging, and much more. A separate Sort package is coming soon.

FORTRAN-80 and COBOL-80 are just two more reasons why the Apple with SoftCard is the world's most versatile personal computer. Get all the exciting details from your Microsoft dealer today. And start getting beyond the BASICs.

MICROSOFT Consumer Products, 400 108th Ave. N.E., Suite 200, Bellevue, WA 98004. (206) 454-1315.

SoftCard is a trademark of Microsoft. Apple II is a registered trademark of Apple Computer, Inc. Z-80 is a registered trademark of Zilog, Inc. CP/M is a registered trademark of Digital Research, Inc.

MICROSOFT

SPECIAL: Additional 10% off on all CBM hardware

INTRODUCING PET RABBIT OR ROM CASSETTE

The PET RABBIT contains high-speed cassette routines, auto-repeat key feature, memory test, decimal to hex, hex to decimal, and other features. Coexists with the BASIC PROGRAMMERS TOOLKIT. Works with 3.0 ROMS (New) and new style cassette deck.

Cassette versions configured for \$1800, \$3000, \$3800, \$7000, and \$7800. (3.0 ROMS only)
Cassette and manual — \$29.95

ROM version configured to plug into P.C. board at \$A000. (Specify 3.0 or 4.0 ROMS)
ROM and manual — \$49.95

FREE ROM RABBIT with purchase of 8K PET and tape deck.

SPECIAL - ROM RABBIT and cassette deck — only \$134.95

MACRO ASSEMBLER AND TEXT EDITOR *Now Atari*

Macro and conditional assembly, string search and replace, 10 char./label, AUTO line numbering. MOVE, COPY, DELETE, NUMBER, and much more 20+ commands, and 20+ pseudo ops.

PET cassette version (ASSM/TED) — \$49.95.
(Specify 2.0, 3.0, or 4.0 ROMS.)

PET disk version (MAE) — \$169.95
(Specify 3.0, 4.0, or 8032)

ATARI cassette version with machine language monitor — \$53.95

FREE ASSM/TED and ROM RABBIT with purchase of 32K PET and cassette deck.

FREE MAE with purchase of 32K PET and disk drive.

TINY-C FOR PET

An adaptation of the TINY-C interpreter sold by Tiny-C Assoc. Useful for learning a modern structured programming language. Diskette — \$50.00. Owners manual — \$50.00

FREE MAE and TINY-C with purchase of 32K PET, disk drive, and printer.

COMPILERS

Graphics Drawing Compiler for PET and SYM. Works with Macro ASSM/TED. The GDC is composed of a number of macros which emulate a high-level graphics drawing language. In addition to the macros, GDC provides some very useful enhancements to the ASSM/TED. Manual and Cassette — \$29.95.

Music and Sound Composer for PET. Works with Macro ASSM/TED. The MSC is composed of a number of macros which emulate a high-level computer music language. In addition to the macros, MSC provides some very useful enhancements to the ASSM/TED. Manual and Cassette — \$29.95.

I/O KIT

PET I/O Experimenters Kit. Allows easy access to IEEE or user port for the construction of external circuits. Kit — \$39.95.

ORDERING TERMS

Send check or money order in U.S. dollars. Add 2% for postage for C8M orders. Overseas software orders add \$5.00. All software mailed free in USA and Canada. Purchase orders acceptable.

EHS IS NOW A COMMODORE DEALER

EHS offers a number of software products for PET, ATARI, APPLE, and other 6502 computers. Now we sell CBM hardware. If you're in the market for PET products, be sure to look for our FREE software offers. Note: Be sure and deduct 10%.

CBM	PRODUCT DESCRIPTION	PRICE
4001-8KN	8K RAM-Graphics Keyboard	\$ 795.00
4001-32KN	32K RAM-Graphics Keyboard	\$1295.00
8032	32K RAM 80 Col.-4.0 O/S	\$1795.00
2022	Tractor Feed Printer	\$ 795.00
4040	Dual Floppy-343K-DOS 2.1	\$1295.00
8050	Dual Floppy-974K-DOS 2.0	\$1695.00
C2N Cassette	External Cassette Drive	\$ 95.00
CBM to IEEE	C8M to 1st IEEE Peripheral	\$ 39.95
IEEE to IEEE	CBM to 2nd IEEE Peripheral	\$ 49.95
8010	IEEE 300 Baud Modem	\$ 395.00
2.0 DOS	DOS Upgrade for 2040	\$ 80.00
4.0 O/S	O/S Upgrade for 40 Column	\$ 110.00
VIC Computer	New Commodore	\$ Call or Write

EDUCATIONAL DISCOUNTS

BUY 2 — GET 1 FREE

TRAP 65

TRAP 65 prevents the 6502 from executing unimplemented instructions. Have you ever had your system to crash on a bad opcode? This is a real machine language debugging tool and time saver. Also useful for teaching trap vectoring and extension of instruction set in schools. 3½ X 4½ printed circuit board which plugs into 6502 socket of any PET, APPLE, SYM. Only \$149.95.

ATARI M.L. MONITOR

Load and save binary data on cassette. Display and change 6502 registers. Will coexist with BASIC. Monitor uses the screen editing capabilities of the ATARI to allow easy use. Cassette and manual — \$9.95 (specify memory size).

ATARI MEMORY TEST

When you purchase a new ATARI or add on new RAM modules, you need to be sure that the memory is working properly. (Remember, you only have a short guarantee on your memory!) Cassette and manual — \$6.95.

APPLE PRODUCTS

Macro ASSM/TED — includes manual, on cassette — \$49.95, on disk — \$55.95

Apple MAE — similar to PET MAE. A powerful assembly development system on diskette for 48K APPLE II or plus. (Requires license agreement) — \$169.95.

PIG PEN — 100% M.L. word processor for use with Apple ASSM/TED. Fast text formatting, vertical and horizontal margins, right and left justification, centering, titles, foots, shapes, etc. Manual and source included, on cassette — \$40.00, on diskette — \$45.00

Apple Mail List System. Provides sorting on zip code or last name. Approximately 1000 names/diskette. Manual and Diskette — \$34.95.

EASTERN HOUSE SOFTWARE

3239 Linda Drive, Winston-Salem, N.C. 27106

Ph. Orders — 9-4 EST (919) 924-2889

After 4 pm 748-8846

Send SASE for free catalog



MTU



Photo credit: GREAT GALAXY IN ANDROMEDA: Palomar Observatory, California Institute of Technology

THE MTU FLOPPY DISK CONTROLLER WITH 16K RAM GIVES YOUR AIM-65 ION DRIVE POWER!

HARDWARE

- 16K 2 PORT RAM ONBOARD WITH WRITE PROTECT
- USES THE NEC-765 DISK CONTROLLER CHIP
- ROM BOOTSTRAP LOADER SPEEDS LOADING
- DMA OPERATION ALLOWS INTERRUPTS
- SUPPORTS 8 INCH DRIVES 1 OR 2 SIDED
- MAXIMUM STORAGE IS 4 MEGABYTES
- ANALOG PLL DATA SEPERATOR

SYSTEM FEATURES

- FORMAT UTILITY LOGS OUT DEFECTIVE SECTORS
- DISK/FILE COPY WITH WILDCARD SELECTION
- SYSTEM CUSTOMIZATION UTILITY
- VISIBLE MEMORY TERMINAL DRIVER PROVIDED
- INTERCHANGE CODOS SOFTWARE AMONG KIM, SYM, AIM, PET SYSTEMS
- IN FIELD USE FOR OVER 6 MONTHS

CODOS SOFTWARE

- CODOS DISK OPERATING SOFTWARE
- 8K RAM RESIDENT ALLOWS UPGRADES
- FINDS AND LOADS 32K BYTES IN 3 SECONDS
- STARTUP FILE EXECUTES AT BOOT-UP
- COMMAND FILE EXECUTION FROM DISK
- DYNAMIC DISK STORAGE ALLOCATION
- DEVICE-INDEPENDENT I/O
- TRUE RANDOM ACCESS TO RECORD IN ONE ACCESS
- MONITOR WITH 29 BUILT-IN COMMANDS
- FULL ENGLISH ERROR MESSAGES
- FILE NAMES 12 CHARACTERS + EXTENSIONS
- FILE SIZE UP TO 1 MEGABYTE
- UP TO 247 FILES PER DISK DRIVE
- INDIVIDUAL WRITE PROTECT ON FILES
- WORKS WITH AIM EDITOR, ASSEMBLER, BASIC AND MONITOR ROMS
- SUPERVISOR CALLS AVAILABLE TO USER PROGRAM

K-1013M Hardware Manual-\$10, K-1013-3M CODOS manual-\$25, K-1013-3D RAM/Disk controller with CODOS-\$595, Floppy drives, cables, power supply also available.

MASTERCARD & VISA accepted

WRITE OR CALL TODAY FOR OUR 48 PAGE FALL 1980 CATALOG DESCRIBING ALL MTU 6502 PRODUCTS, INCLUDING 320 BY 200 GRAPHICS, AIM GRAPHIC/TEXT PRINT SOFTWARE, BANK-SWITCHABLE RAM/ROM/I-O, AIM CARD FILE, POWER SUPPLY AND MORE!

MICRO

THE 6502 JOURNAL

STAFF

Editor/Publisher
ROBERT M. TRIPP
Associate Publisher
RICHARD RETTIG
Associate Editor
MARY ANN CURTIS
Art Director
GARY W. FISH
Typesetting
EMMALYN H. BENTLEY
Advertising Manager
L. CATHERINE BLAND
Circulation Manager
CAROL A. STARK
MICRO Specialists
APPLE: FORD CAVALLARI
PET: LOREN WRIGHT
OSI: PAUL GEFFEN
Comptroller
DONNA M. TRIPP
Bookkeeper
KAY COLLINS

MICRO™ is published monthly by:
MICRO INK, Inc., Chelmsford, MA 01824
Second Class postage paid at:
Chelmsford, MA 01824 and additional
offices
Publication Number: COTR 395770
ISSN: 0271-9002

Subscription Rates: *Per Year*
U.S.
through March 31 \$15.00
thereafter \$18.00
Foreign surface mail \$21.00
Air mail:
Europe \$36.00
Mexico, Central America \$39.00
Middle East, North Africa \$42.00
South America, Central Africa \$51.00
South Africa, Far East, \$60.00
Australasia \$60.00

For back issues, subscriptions, change
of address or other information, write to:
MICRO
P.O. Box 6502
Chelmsford, MA 01824
or call
617/256-5515

Copyright© 1981 by MICRO, INK, Inc.
All Rights Reserved

CONTENTS

7 A SIMPLE SECURITIES MANAGER FOR THE APPLE
Use the Apple to evaluate your holdings
By Ronald A. Guest

15 WHY WAIT?
Understand and use the WAIT function in Ohio Scientific's C1P
By Robert L. Elm

17 AN ATARI ASSEMBLER
A one-pass assembler, in BASIC, for the Atari 400 or 800
By William L. Colsher

21 TURNING USR (X) ROUTINES INTO DATA STATEMENTS
Save machine language routines as BASIC DATA statements
By Thomas Cheng

23 IMPROVED DUAL TAPE DRIVE FOR SYM-1 BASIC
Greatly enhance the use of two cassettes while occupying less than one
page of memory
By George Wells

31 IN THE HEART OF APPLESOFT
How and when to use (numerical) Applesoft routines
By C. Bongers

50 ONE-DIMENSIONAL LIFE ON THE AIM 65
This version of Life can be easily modified for other 6502 systems
By Larry Kollar

57 INCREASE KIM-1 VERSATILITY AT LOW COST
Add I/O devices in page 5 without developing bus contention
By Ralph Tenny

65 PET STRING FLIP
Solve the problem of upper and lower case inversion when using 2022 and
2033 printers
By James Strasma

71 A C1P SOUND IDEA
Add a bell tone for the C1P or Superboard II
By David A. Ell

75 DOES ANYONE REALLY KNOW WHAT TIME IT IS?
Use a new clock chip with your 6502 and find out
By Randy Sebra

DEPARTMENTS

5 Editorial — Too Many Apples! — Robert M. Tripp
6 Letterbox
54 New Publications
59 Microbes
68 PET Vet — Loren Wright
67 The MICRO Software Catalog: XXIX
90 6502 Bibliography: Part XXIX — William R. Dial
95 Advertisers' Index

DATA CAPTURE 4.0TM

The most advanced and easiest to use telecommunications program for use with the MICROMODEM IITM or the Apple COMMUNICATIONS CARDTM

Q. Will DATA CAPTURE 4.0 work with my Communications CardsTM and a modem?
A. It makes using the Comm. Card almost as easy as using the Micromodem II.

Q. Do I need an extra editor to prepare text for transmission to another computer?
A. No. DATA CAPTURE 4.0 gives you control of the text buffer. You can use DATA CAPTURE 4.0 to create text.

Q. Can I edit the text I have prepared?
A. Yes. You can insert lines or delete any lines from the text.

Q. How about text I have captured. Can I edit that?
A. As easily as the text you have prepared yourself. You can delete any lines you don't want to print or save to a disk file. You can also insert lines into the text.

Q. Just how much text can I capture with DATA CAPTURE 4.0?
A. If the system with which you are communicating accepts a stop character, most use a Control S, you can capture an unlimited amount of text.

Q. How does that work? And do I have to keep an eye on how much I have already captured?
A. When the text buffer is full the stop character is output to the other system. Then DATA CAPTURE 4.0 writes what has been captured up to that point to a disk file. This is done automatically.

Q. Then what happens?
A. Control is returned to you and you can send the start character to the other system. This generally requires pressing any key, the RETURN key or a Control Q.

Q. Are upper and lower case supported if I have a Lower Case Adapter?
A. Yes. If you don't have the adapter an upper case only version is also provided on the diskette.

Q. Do I need to have my printer card or Micromodem IITM or Communications CardsTM in any special slot?
A. No. All this is taken care of when you first run a short program to configure DATA CAPTURE 4.0 to your system. Then you don't have to be concerned with it again. If you move your cards around later you can reconfigure DATA CAPTURE 4.0.

Q. Do I have to build a file on the other system to get it sent to my Apple?
A. No. If the other system can list it you can capture it.

Q. How easy is it to transmit text or data to another system?
A. You can load the text or data into DATA CAPTURE 4.0 from the disk and transmit it. Or you can transmit what you have typed into DATA CAPTURE 4.0.

Q. How can I be sure the other system receives what I send it?
A. If the other system works in Full Duplex, it 'echoes' what you send it, then DATA CAPTURE 4.0 adjusts its sending speed to the other system and won't send the next character until it is sure the present one has been received. We call that 'Dynamic Sending Speed Adjustment'.

Q. What if the other system works only in Half Duplex.
A. A different sending routine is provided for use with Half Duplex systems.

Q. What if I want to transmit a program to the other system?
A. No problem. You make the program into a text file with a program that is provided with DATA CAPTURE 4.0, load it into DATA CAPTURE 4.0 and transmit it.

Q. What type files can I read and save with DATA CAPTURE 4.0?
A. Any Apple DOS sequential text file. You can create and edit EXEC files, send or receive VISCIALCTM data files, send or receive text files created with any editor that uses text files.

Q. Can I leave DATA CAPTURE 4.0 running on my Apple at home and use it from another system?
A. Yes. If you are using the Micromodem IITM you can call DATA CAPTURE 4.0 from another system. This is handy if you are at work and want to transmit something to your unattended Apple at home.

Q. Where can I buy DATA CAPTURE 4.0?
A. Your local Apple dealer. If he doesn't have it ask him to order it. Or if you can't wait order it directly from Southeastern Software. The price is \$65.00. To order the Dan Paymar Lower Case Adapter add \$64.95 and include the serial number of your Apple.

Q. If I order it directly how can I pay for it?
A. We accept Master Charge, Visa or your personal check. You will get your order shipped within 3 working days of when we receive it no matter how you pay for it. Send your order to us at the address shown or call either of the numbers in this advertisement. You can call anytime of day, evening or Saturdays.

Q. I bought DATA CAPTURE 3.0 and DATA CAPTURE 4.0 sounds so good I want this version. What do I do to upgrade?
A. Send us your original DATA CAPTURE 3.0 diskette and documentation, the \$35.00 price difference and \$2.50 for postage and handling. We will send you DATA CAPTURE 4.0 within 3 working days of receiving your order.

Q. What kind of support can I expect after I buy it?
A. If you have bought from Southeastern Software in the past you know we are always ready to answer any questions about our products or how to use them.

Requires DISK IITM, Applesoft IITM and 48K of Memory

DATA CAPTURE 4.0TM

Copyright © 1980-Southeastern Software

*Apple, Apple II Plus, Disk IITM and APPLESOFT IITM are trademarks of Apple Computer Company.

**Micromodem IITM is a trademark of D.C. Hayes Associates, Inc.

ViscailcTM Copyright by Software Arts, Inc.



We welcome your personal check. We also accept Visa and Master Charge.

Southeastern Software

Dept. MK
6414 Derbyshire Drive • New Orleans, LA 70126
504/246-8438 504/246-7937

MICRO

Editorial

Too Many Apples!

MICRO was founded in 1977 to provide coverage for the *entire* spectrum of 6502 microprocessor-based systems. At the time, there were only three major systems available: the KIM-1 which had been around for a year or two and had generated much of the initial interest in the 6502 microprocessor; the PET which was just starting to come off the production line in limited numbers; and, the Apple II which was also just starting to arrive in computer stores. Since then, several new systems have been added: a number of systems from Ohio Scientific, the AIM 65, the SYM-1, the Atari.

MICRO has endeavored to provide coverage of all these systems, as well as to provide 6502-related information which was not specific to any microcomputer. For reasons difficult to understand, we have received far more high-quality material about the Apple II than about the other microcomputers! This has lead to uneven coverage and other problems.

If we selected articles purely on merit, the magazine would quickly become overweighted with Apple material, because the quantity of good

Apple articles would crowd out the smaller quantity of good articles on other microcomputers. A second option is no better. As we expand the number of pages in MICRO, even if we held constant the amount of space devoted to non-Apple microcomputers and assigned the additional pages to Apple material, the magazine would still be out of balance, and many non-Apple readers would feel slighted.

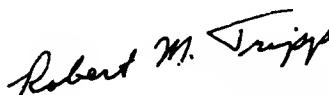
Furthermore, due to the quantity of good articles, the delay between submission and publication of Apple articles has grown to an unacceptable level. I feel that articles should be published as quickly as possible so that the author gets his ideas into print in a short time, so that the author can promptly collect payment for his work, and so that the reader gets up-to-date information. To solve these problems, several ideas are under consideration:

0. No change—keep on as is.
1. Print the *best* material in MICRO—without regard to which microcomputer it pertains. If this means that the Apple overwhelms the rest, so be it.
2. Allocate a larger portion of MICRO to coverage of the Apple, perhaps even adding as many as 16 to 32 extra pages, so that coverage of the other microcomputers does not diminish.
3. Publish an Apple Supplement or Apple Quarterly which would permit the Apple-specific material, which would normally not appear due to lack of space, to be printed in a timely fashion.

4. Print the "extra" Apple material in book form. This is being done to some extent with the publication of our MICRO/Apple which is scheduled to appear in April 1981. While this volume will primarily consist of material previously printed in MICRO, with numerous updates by the original authors, new listings, and optional disks with programs, other volumes could include original material which has not appeared in MICRO and which may never appear in the magazine.

5. If enough Apple material is available, publish a *monthly* Apple magazine of the calibre of MICRO (Note: There are already some 30 periodicals of various quality and frequency devoted exclusively to the Apple). At the same time, divest MICRO of all specific Apple articles and transform it to a magazine devoted to the "other" microcomputers. MICRO could still remain an overall 6502 resource publication carrying general material applicable to the Apple as well as other 6502-based computers.

Since any decision we make could greatly affect our coverage of the Apple, we would like to get some feedback from Apple readers. Which of the above options do you prefer, or can you suggest any alternatives?



Editor/Publisher

About the Cover



Travel Options

Travel options were few in the days of George Washington and Abraham Lincoln (whose birthdays are celebrated this month), two of the U.S. presidents portrayed here in Mt. Rushmore National Monument, South Dakota. Washington rode his horse to the capital and Lincoln took the train.

Today, when we make travel plans, we have innumerable options. There are countless, massive data bases compiled by airlines, hotels, travel agencies, camping organizations, auto clubs, and local and

national tourism promotion bureaus. A few of these data bases are already directly linked to microcomputer networks such as The Source and Micronet.

In a short while, we can expect microcomputers to weigh our individual vacation whims against our budgets, present us in advance with pictures of our destination, and plot our unique travel course, with every big and little detour we have time and money for.

Designing possible trips will be fun and, for armchair travelers, even a game. (Photo by Gary Fish.)

MICRO

Letterbox

Dear Editor:

I am a long-time MICRO reader and fan. While I find the magazine very informative in terms of programs and routines, I feel that there is a lack in terms of reader communications. Perhaps the readers are to blame, but I can't really believe that you receive too few letters to support a Letterbox column.

Perhaps it is editorial policy. While the magazine is generally well-filled with articles, it seems no space is set aside on a consistent basis for feedback and exchange of ideas by the readers. In issue 23 you said you hoped to make the Letterbox a monthly feature. Since then, Letterbox has only appeared in issues 26, 27, and 29. Issue 26 Letterbox was devoted to specifics on 16 bit 650x wishlists. This doesn't seem to leave much room for other general reader communications.

I suggest that you establish Letterbox permanently for 6 months. If you receive no interesting letters for the month, simply take one sentence to say so. I believe if you make the space available, readers will respond.

Frank Lawyer
126 Demott Lane
Somerset, New Jersey 08873

We are now receiving enough letters of general interest to make Letterbox a permanent department of MICRO. Despite this increase in mail, we encourage more readers to write in. Take advantage of the opportunity provided by Letterbox. Share brief communications with your fellow readers. Use Letterbox as your forum!

The Editor

Dear Editor:

I am interested in contacting people who have used their Apple computer as a text editor/word processor and have substantial text files of articles or other ordinary writing. I want to borrow the files and tear them apart into words for a research project.

For a possible commercial use, I would like to hear from people who have developed data bases on the Apple. For example, an address file that could not otherwise be sold might yield street names for a particular city for use in a game, in research, or for a developer looking for new names.

Mike Firth
104 N. St. Mary
Dallas, Texas 75214

Dear Editor:

I am interested in contacting other users of the CGRS Microtech disk operating system, CRS/DOS, which is installed on my 6502/S100 homebrew development system. I am an experienced hardware designer and novice assembly language programmer who is having trouble understanding the use of the CRS assembler, editor and certain DOS functions. Microtech appears to be growing rapidly and while the DOS appears quite powerful, they have not found time to hold my hand while I learn to use it. I'm sure that input from other users would save me a great deal of trial and error, and am willing to either pay someone or trade hardware expertise for help. Specifically, I need hints as to the meaning of disk error messages (hex), an editor manual, an assembler error message table, and a way to copy individual system routines from one diskette to another without reinitializing the entire diskette.

I am also interested in hearing from folks in the Bay Area who might wish to assist with applications programming on our real-time music performance system based on the above DOS and extensive hardware, either for cash or in exchange for hardware design and construction.

Clance
Power Bus Garage
2000 Center St. #6502
Berkeley, California 94704
(415) 549-0541 (days)
524-9586 (evenings)

Dear Editor:

I eagerly read Robert Phillips' article on "The Binary Sort" in the February 1980 issue of MICRO (21:15), although I had to work my way through the special character omissions. Mr. Phillips' approach is very reasonable but not the one that came to my mind when I recently had the same goal.

I use 3 pointers instead of 2, keeping track of the beginning (N0) and end (N1) of the range yet to be searched. The array element in the middle of this range (L1\$(PT)) is compared with the item searched for (SW\$), and either N1 or N0 is set to PT if the comparison fails, depending upon whether the comparison value is above or below the array element, respectively. This approach eliminates the need to check the last element of the array at the end of the search.

I have written this procedure as a subroutine, using the same variable names as Mr. Phillips where possible. I have added a test for an empty array and the variable FO which is 0 if the search has failed, or 1 if it has succeeded. If the search fails, SW\$ can be inserted at position PT by first moving elements PT to TL down one and increasing TL by one.

```
10 IF TL = 0 THEN PT = 1:  
FO = 0: RETURN  
20 FO = 1: N0 = 0: N1 = TL  
+ 1  
30 PT = INT((N1 + N0) / 2)  
40 IF PT = 0 OR PT = N0  
GOTO 80  
50 IF L1$(PT) = SW$ THEN  
RETURN (found it)  
60 IF L1$(PT) > SW$ THEN  
N1 = PT: GOTO 30  
70 N0 = PT: GOTO 30  
80 PT = PT + 1  
90 FO = 0  
100 RETURN (search has failed)
```

James A. Petrich, Ph.D.
5123 Sirretta
San Antonio, Texas 78233

A Simple Securities Manager for the Apple

Manage your stocks more carefully in these volatile times! Use this simple program to record security transactions, keep track of gains and losses, and evaluate your holdings at any time.

Ronald A. Guest
12153 Melody Dr. #204
Denver, Colorado 80234

One of the many uses of a home computer is for record keeping. And one of the (hopefully) most profitable types of record to keep is security transactions. In the highly volatile economic circumstances which now exist, it has become increasingly more important to have accurate information readily at hand. In this area, a small computer can be a big help.

I have written a program to assist in making decisions about my holdings. This program runs on a 32K Apple with ROM Applesoft and a Disk II. The output of the program is heavily oriented toward the standard 24 x 40 Apple display, but as you will see, it produces adequate results when used with a hard-copy printer. Three types of reports may be generated, and four types of operations may be performed on the securities data.

The stock manager program is tailored to fit my own needs, and others may require different reports or formats. I will try to provide sufficient information in this article to allow the program to be easily modified.

```
ALL/NOTSOLD/SOLD A
PRESS 'RETURN' WHEN READY
NAME PDATE SDATE PPRICE SPRICE DIV
GETRI 021379 082779 1517.3 875.5 0
200
MBI 060179 2832.3 5124.3 3.5
100
PLUMM 031479 071579 5786.8 8514.1 0
200
TURKE 052278 827.3 1159.5 .8
400
4M 120579 879.3 945.8 1.3
150

TOTALS
PPRICES 11842.75
SPRICES 16619.125
PRESS 'RETURN' WHEN READY
```

Listing 1

```
CURRENT DATE (MMDDYY) 033180
ALL/NOTSOLD/SOLD A
PRESS 'RETURN' WHEN READY
NAME $GAIN %GAIN
GETRICHQUI -641.75 -42.3
MBI 2292 80.93
PLUMMET 2727.38 47.13
TURKEY 332.25 40.16
4M 66.5 7.56

TOTALS $GAIN 4776.38
%GAIN 40

PRESS 'RETURN' WHEN READY
```

Listing 2

```
CURRENT DATE (MMDDYY) 033180
ALL/NOTSOLD/SOLD A
PRESS 'RETURN' WHEN READY
NAME $GAIN %GAIN
MBI 258.75 9
TURKEY 550 66
4M 46.88 5

TOTALS $GAIN 855.63
%GAIN 19

PRESS 'RETURN' WHEN READY
```

Listing 3

Reports

The three types of reports which may be requested are: a listing of the data in the current portfolio, a listing of the appreciation in the portfolio, and a (very) rough estimate of the dividends paid by the portfolio. In all three of the reports, the user may select that all securities be listed, that all unsold securities be listed, or that all sold securities be listed.

The List report outputs all of the information stored in the disk file for the selected class of holdings. The information printed includes the first five characters of the name, the purchase and sale dates, the purchase and sale prices, the per share dividend, and the number of shares (listing 1). Up to five holdings may be printed per page, and the totals of the purchase prices and sale prices will be printed on the final page. For an explanation of the meaning of the sale date and sale price for a security which has not yet been sold, see the paragraphs on adding an entry and on reading a data file.

The appreciation report lists the dollar and percent gains (losses) for each of the stocks listed. At the end of the report, the total dollar gain and the percent gain (loss) based on the purchase price are printed for the holdings selected (listing 2). If a security was sold 12 or more months after it was purchased, or if the security was purchased 12 or more months prior to the current date, then the name is displayed in inverse video indicating that the holding may be eligible for long-term gain. Since the printer will not output inverse characters, a box was drawn around the names of stocks falling into this category.

A report of the dividends paid for the selected stocks provides an estimate of the dollar amount paid from the time the security was purchased to the time it was sold (or the current date if not yet sold). Only the selected securities with non-zero dividends are listed. The estimate is based on the number of months a security was held (listing 3). Since most securities pay dividends on specific dates, holdings which are quickly sold may show a dividend on the report, but have never been paid out. Since my investment goals are heavily oriented toward capital appreciation, the discrepancy does not bother me. People with different investment goals may wish to improve the estimates.

Operations on Data

The stock manager stores information in a sequential text file. A free format is used which allows each element to vary in length. The first element of the data file is a count of the number of entries in that file. The remainder of the file contains the entries. A security's entry, in the order of appearance, is: name, purchase date, sale date, purchase price, sale price, dividend, and number of shares.

When first run, the stock manager will have no entries, so the first command to execute is the ADD command. ADD requests the information which

will be stored in the data file. All dates should be entered in the form MMDDYY with no slashes or other separators. The date must be six characters in length, so each field must be zero-filled. For instance, February 2, 1979 would be entered as 020279. When adding an entry for an as yet unsold security, enter a single blank for the sale date.

After adding all of the entries desired, a WRite command should be performed. WRite will prompt for a file name, and then output the entries to disk. Before any reports are generated, a REad command should be executed. The REad will ask for the file name and then read the data file. After closing the data file, REad will prompt for the current price of all holdings which have not yet been sold. This price is then used in generating reports. Note that the price entered should be the total price, not the per share price.

If an error is made adding an entry, or if a holding is sold, the data may be updated with the CHange command. CHange searches for the given name and then requests the new information. If a holding is to be deleted, enter an * for the name. Be sure to do a WRite if the changes are to be permanent. If more than one entry in a portfolio has the same name (to the 25th character), the month purchased or some other difference should be introduced to allow a unique search. When the stock manager is EXited, it asks if the file should be updated. An answer of 'yes' will cause a WRite to be performed.

The stock manager was written to allow new commands or data fields to be added easily. To add a command, choose an unused entry in CMD\$ (denoted by 'XX') and substitute the first two characters of the new command (lines 130-133). Between lines

330-399, output the command name and description for the menu. On line 510, change the entry in the GOSUB list corresponding to the index into CMD\$ to the line number of the new command.

Adding a new data field is just as easy. Simply dimension the new field appropriately in lines 100-110. Then add a line in 36240-36280 to input the field, add a line in 38240-38255 to print the field, and add a line in 40110-40190 to enter the field into the data area. A list of the major variables and their usage is given in table 1 and a list of the subroutines is in table 2.

Table 1: List of variables.

ANS	Indicates what class of stocks to list All(0)/Notsold(1)/Sold(2)
CC	Index of last entry in CMD\$
CD\$	Current date
CMD\$	Array of two character command names
COUNT	Number of holdings in current file
D\$	Control-D for DOS
DG	Dollar gain
DV	Array of per share dividends
F\$	File name containing stocks
INDEX	Index to stock holdings
LINE	Number of lines being displayed
MN	Number of months between sale (or current) date and purchase date
NM\$	Array of stock names
PD\$	Array of purchase dates
PP	Array of purchase prices
SD\$	Array of sale dates (1 blank if not sold)
SH	Array of number of shares
SP	Array of sale prices
TPP	Total purchase prices
TSP	Total sale prices
TV	Same as TPP
YR	Number of years between sale (or current) date and purchase date

Persons without a disk may also use this program by changing the REad routine to use BASIC READ and DATA statements. The WRite, CHange, and ADD routines can then be deleted since changes to the entries can be made by retyping the appropriate DATA statement. With these modifications, the program should easily run on a 16K cassette system (Applesoft in ROM).

Listing 4

```

10 REM
    STOCK HOLDINGS MANAGER
20 REM      BY
25 REM      R. A. GUEST
30 REM
    COPYRIGHT (C) 1980 R. A.
    GUEST
100 DIM NM$(25),FD$(25),SD$(25),
    PP(25),SP(25),DV(25)
101 DIM CMD$(10),SH(25)
120 REM
    INIT COMMAND STRINGS
130 CMD$(0) = "AP":CMD$(1) = "EX"
    :CMD$(2) = "CH"
131 CMD$(3) = "XX":CMD$(4) = "DI"
    :CMD$(5) = "XX"
132 CMD$(6) = "LI":CMD$(7) = "XX"
    :CMD$(8) = "RE"
133 CMD$(9) = "WR":CMD$(10) = "AD"
    :
135 COUNT = 0
140 CC = 10: REM LAST COMMAND
150 D$ = CHR$(4)
200 TEXT : HOME
210 VTAB 8: HTAB 12
220 PRINT "STOCK MANAGER 1.0"
230 VTAB 12: HTAB 13: INVERSE
240 PRINT "BY R. A. GUEST": NORMAL
250 FOR I = 1 TO 1000: NEXT I
300 REM DISPLAY MENU
310 HOME : T = FRE(0): REM CLEA
    N UP STRINGS
320 VTAB 2: HTAB 18
325 REM
    PRINT COMMANDS
330 PRINT "MENU"
340 VTAB 4: INVERSE : PRINT "ADD"
    "": NORMAL : PRINT " HOLDING"
    "
350 INVERSE : PRINT "APPRECIATIO
    N"
360 PRINT "CHANGE": NORMAL : PRINT
    " HOLDING"
370 INVERSE : PRINT "DIVIDENDS": "
    NORMAL
380 INVERSE : PRINT "LIST": NORMAL
    : PRINT " HOLDINGS"
390 INVERSE : PRINT "READ": NORMAL
    : PRINT " DATA FILE"
395 INVERSE : PRINT "WRITE": NORMAL
    : PRINT " DATA FILE"
399 INVERSE : PRINT "EXIT": NORMAL

```

```

400 VTAB 22: HTAB 10
410 INPUT "COMMAND: ";YN$
415 REM
    SEARCH FOR COMMAND
420 FOR I = 0 TO CC: IF CMD$(I) =
    LEFT$(YN$,2) GOTO 500
430 NEXT
440 GOTO 400
500 I = I + 1
510 ON I GOSUB 20000,18000,24000
    ,19000,28000,19000,32000,190
    00,36000,38000,40000
600 GOTO 300
18000 REM
    EXIT
18020 INPUT "DO YOU NEED TO UPDA
    TE FILE ";YN$
18040 IF LEFT$(YN$,1) = "Y" THEN
    GOSUB 38000: REM
    CLEAR AND UPDATE
18060 END
19000 REM
    UNIMPLEMENTED
19040 PRINT "NO SUCH COMMAND"
19060 RETURN
20000 REM
    CAPITAL GAINS(AP)
20010 REM
    HOLDINGS >1 YEAR
20020 REM
    INVERSED FOR LTG
20080 INPUT "CURRENT DATE (MMDDYY
    ) ";CD$
20100 HOME : VTAB 10: HTAB 13
20120 INPUT "ALL/NOTSOLD/SOLD ";
    YN$
20140 ANS = 0: IF LEFT$(YN$,1) =
    "N" THEN ANS = 1
20160 IF LEFT$(YN$,1) = "S" THEN
    ANS = 2
20200 REM
20210 INDEX = 0: HOME : LINE = 30:
    DG = 0:TV = 0
20220 IF INDEX > = COUNT GOTO 2
    0900: REM DONE
20230 IF ANS = 0 GOTO 20300
20240 IF (ANS = 1) AND (SD$(INDE
    X) < > " ") GOTO 20540
20260 REM
    USE 'ADD' TO ENTER INF
    OR

```

(continued)

Listing 4 (continued)

```

20300 REM OUTPUT HEADER
20320 IF LINE > 18 THEN GOSUB 5
2000
20330 F1 = 0: REM IF NOT SOLD, USE
E CURRENT DATE
20340 IF SD$(INDEX) = " " THEN F
1 = 1: SD$(INDEX) = CD$
20349 REM
    CALCULATE YEAR DIFFER-
    NCE
20350 TP = VAL (RIGHT$ (SD$(IND-
    EX),2)) - VAL (RIGHT$ (PD$-
    (INDEX),2))
20351 TP = TP * 12: REM CONVERT T-
    O MONTHS
20355 REM
    CALCULATE MONTH DIFFER-
    ENCE
20360 TP = TP + VAL (LEFT$ (SD$-
    (INDEX),2)) - VAL (LEFT$ (-
    PD$(INDEX),2))
20362 REM
    DELETE ENTRY
20365 IF TP < 12 GOTO 20395
20370 INVERSE : REM LONG TERM GA-
    IN
20395 IF F1 THEN SD$(INDEX) = "
    .
20400 PRINT LEFT$ (NM$(INDEX),1
    0);: NORMAL : HTAB 12
20410 REM
    CALCULATE DOLLAR GAIN
20420 TF$ = STR$ (INT ((SP(INDE-
    X) - PP(INDEX)) * 100 + .5) /
    100)
20430 IF LEN (TF$) < 8 THEN TF$-
    = " " + TF$: GOTO 20430
20440 PRINT TF$;: HTAB 20
20450 DG = DG + VAL (TF$): REM T-
    OTAL DOLLAR VALUE
20460 TV = PP(INDEX) + TV: REM T-
    OTAL VALUE
20465 REM
    CALCULATE % GAIN
20470 TT = (VAL (TP$) / PP(INDEX
    )) * 100
20480 TT$ = STR$ (INT (TT * 100
    + .5) / 100): REM PERCENT G-
    AIN
20490 IF LEN (TT$) < 7 THEN TT$-
    = " " + TT$: GOTO 20490
20500 PRINT TT$
20520 LINE = LINE + 1
20540 INDEX = INDEX + 1

```

```

20560 GOTO 20220: REM DO NEXT 0
    NE
20890 REM
    PRINT TOTALS
20900 PRINT : PRINT "TOTALS";: HTAB
    10: PRINT "$GAIN ";: DG
20910 IF TV = 0 GOTO 20940
20920 HTAB 10: PRINT "%GAIN ";( INT
    ((DG / TV) * 100 + .5))
20940 PRINT
20960 GOSUB 51000: REM WAIT FOR
    KEY PRESS
20970 RETURN
24000 REM
    CHANGE/DELETE HOLDING
24020 REM
    INPUT '*' FOR NAME TO
    DELETE
24040 REM
    INPUT A BLANK FOR SALE
    DATE IF NOT YET SOLD
24200 INPUT "SEARCH STRING "; TS$
24220 FOR K = 0 TO (COUNT - 1)
24222 IF TS$ = LEFT$ (NM$(K), LEN
    (TS$)) GOTO 24300
24225 NEXT K
24240 PRINT "NOT FOUND": FOR KK =
    1 TO 300: NEXT : RETURN
24300 TP = COUNT: COUNT = K
24302 PRINT NM$(K): PRINT PD$(K)
    : PRINT SD$(K): PRINT PP(K):
    PRINT SP(K): PRINT DV(K): PRINT
    SH(K)
24320 PRINT "ENTER '*' FOR NAME
    TO DELETE."
24330 FOR KK = 1 TO 400: NEXT
24340 GOSUB 40100: REM GET FIELD
    S
24360 IF NM$(K) < > "*" THEN CO-
    UNT = TP: RETURN
24365 COUNT = COUNT - 1
24367 REM
    MOVE REST DOWN IN LIST
24370 FOR K = COUNT TO TP - 2
24380 K1 = K + 1
24390 NM$(K) = NM$(K1): PD$(K) = P-
    D$(K1): SD$(K) = SD$(K1)
24400 PP(K) = PP(K1): SP(K) = PP(K
    1): DV(K) = DV(K1): SH(K) = SH
    (K1)
24420 NEXT
24440 COUNT = TP - 1
24460 RETURN

```

```

26000 REM
    CLEAR SALE PRICE OF UN
    SOLDS

26100 FOR I = 0 TO COUNT - 1
26120 IF SD$(I) = " " THEN SP(I)
    = 0
26140 NEXT
26200 RETURN
28000 REM
    ESTIMATE DIVIDEND GAIN

28020 INPUT "CURRENT DATE (MMDDYY
Y) ";CD$
28040 HOME : VTAB 10: HTAB 13
28060 INPUT "ALL/NOTSOLD/SOLD ";
    YN$
28080 ANS = 0: IF LEFT$(YN$,1) =
    "N" THEN ANS = 1
28100 IF LEFT$(YN$,1) = "S" THEN
    ANS = 2
28120 INDEX = 0: HOME :LINE = 30:
    DG = 0:TV = 0
28180 REM TEST IF DONE
28200 IF INDEX > = COUNT THEN 2
    8900
28220 IF ANS = 0 GOTO 28280
28240 IF (ANS = 1) AND (SD$(INDE
    X) < > " ") GOTO 28620
28260 IF (ANS = 2) AND (SD$(INDE
    X) = " ") GOTO 28620
28270 REM PRINT HEADER
28280 IF LINE > 18 THEN GOSUB 5
    2000
28290 REM
    USE CURRENT DATE OR UN
    SOLDS

28300 IF DV(INDEX) = 0 GOTO 2862
    0: REM DON'T USE
28305 F1 = 1
28310 IF SD$(INDEX) = " " THEN F
    1 = 1:SD$(INDEX) = CD$
28315 REM
    CALCULATE MONTHS

28320 MN = VAL ( LEFT$ (SD$(INDE
    X),2)) - VAL ( LEFT$ (PD$(I
    NDEX),2))
28323 REM
    CALCULATE YEARS

28325 YR = VAL ( RIGHTS$ (SD$(IND
    EX),2)) - VAL ( RIGHTS$ (PD$(
    INDEX),2))
28327 REM
    CONVERT TO MONTHS

28330 MN = MN + YR * 12
28340 IF F1 THEN SD$(INDEX) = "

```

```

28400 PRINT LEFT$ (NM$(INDEX),1
    0):; HTAB 12
28410 REM
    ESTIMATE DIVIDENDS PAI
    D

28420 TP = INT ((DV(INDEX) * SH(
    INDEX) * (MN / 12)) * 100 +
    .5) / 100
28440 TP$ = STR$ (TP)
28460 IF LEN (TP$) < 8 THEN TP$ =
    " " + TP$: GOTO 28460
28480 PRINT TP$;: HTAB 20
28490 REM
    CALCULATE DOLLAR GAIN
    AND
28495 REM
    TOTAL VALUE

28500 DG = DG + VAL (TP$):TV = T
    V + PP(INDEX)
28510 REM
    CALCULATE % GAIN

28520 TT = INT (( VAL (TP$) / PP
    (INDEX)) * 100 + .5)
28540 TT$ = STR$ (TT)
28560 IF LEN (TT$) < 7 THEN TT$ =
    " " + TT$: GOTO 28560
28580 PRINT TT$
28600 LINE = LINE + 1
28620 INDEX = INDEX + 1
28640 GOTO 28200
28900 GOSUB 20900: REM
    OUTPUT TO
    TALS

28920 RETURN
32000 REM
    LIST CURRENT HOLDINGS

32100 HOME : VTAB 10: HTAB 10
32110 INPUT "ALL/NOTSOLD/SOLD ";
    YN$
32120 ANS = 0: REM ALL
32130 IF LEFT$(YN$,1) = "N" THEN
    ANS = 1: REM NOTSOLD
32140 IF LEFT$(YN$,1) = "S" THEN
    ANS = 2: REM SOLD
32210 INDEX = 0: HOME :LINE = 30:
    TPP = 0:TSP = 0
32300 IF INDEX > = COUNT GOTO 3
    2900
32302 IF ANS = 0 GOTO 32310
32304 IF (ANS = 1) AND (SD$(INDE
    X) < > " ") GOTO 32310
32306 IF (ANS = 2) AND (SD$(INDE
    X) = " ") GOTO 32310
32308 INDEX = INDEX + 1: GOTO 323
    00

```

(continued)

Listing 4 (continued)

```

32310 IF LINE > 18 THEN GOSUB 5
0000: REM WAIT AND PRINT HEA
DER
32320 PRINT LEFT$ (NM$(INDEX),5
) #: HTAB 7
32330 PRINT LEFT$ (PD$(INDEX),6
) #: HTAB 14
32340 PRINT LEFT$ (SD$(INDEX),6
) #: HTAB 21
32350 REM
    PURCHASE PRICE
32360 TP$ = STR$ ( INT (PP(INDEX
) * 10.0 + 0.5) / 10.0)
32380 IF LEN (TP$) < 7 THEN TP$ =
" " + TP$; GOTO 32380
32390 PRINT TP$ #: HTAB 29
32395 REM
    SALE PRICE
32400 TP$ = STR$ ( INT (SP(INDEX
) * 10.0 + 0.5) / 10.0)
32410 IF LEN (TP$) < 7 THEN TP$ =
" " + TP$; GOTO 32410
32420 PRINT TP$ #: HTAB 37
32425 REM
    DIVIDEND
32430 TP$ = STR$ ( INT (DV(INDEX
) * 10.0 + 0.5) / 10.0)
32440 IF LEN (TP$) < 3 THEN TP$ =
" " + TP$; GOTO 32440
32450 PRINT TP$
32455 REM
    NUMBER OF SHARES
32460 PRINT " "; SH(INDEX)
32465 REM
    COMPUTE TOTAL SALES AN
D
32466 REM
    TOTAL PURCHASE PRICES
32470 TSP = TSP + SP(INDEX); TPP =
TPP + PP(INDEX)
32480 PRINT
32800 LINE = LINE + 3
32810 INDEX = INDEX + 1
32820 GOTO 32300
32880 REM
    PRINT TOTALS
32900 PRINT : PRINT "TOTALS"
32910 HTAB 10: PRINT "PPRICES " ;
TPP
32920 HTAB 10: PRINT "SPRICES " ;
TSP
32960 GOSUB 51000: REM WAIT FOR
KEY PRESS
32970 RETURN
36000 REM

```

READ STOCK LISTING FIL
E

```

36100 INPUT "FILE NAME "; F$
36120 PRINT D$;"OPEN "; F$
36140 PRINT D$;"READ "; F$
36200 INPUT COUNT
36220 FOR I = 0 TO (COUNT - 1)
36240 INPUT NM$(I): INPUT PD$(I)
: INPUT SD$(I)
36260 INPUT PP(I): INPUT SP(I)
36280 INPUT DV(I): INPUT SH(I)
36285 REM
    CHECK FOR NOT SOLD
36290 IF LEN (SD$(I)) < 6 THEN
SD$(I) = " "
36300 NEXT
36320 PRINT D$;"CLOSE "; F$
36325 REM
    GET PRICES FOR STOCKS
NOT SOLD
36330 FOR I = 0 TO (COUNT - 1)
36340 IF SD$(I) < > " " GOTO 36
370
36350 PRINT NM$(I)
36360 INPUT "CURRENT PRICE "; SP(
I)
36370 NEXT
36400 RETURN
38000 REM
    UPDATE STOCK LISTING F
ILE
38050 GOSUB 26000: REM CLEAR NOT
SOLD PRICES
38100 INPUT "FILE NAME "; F$
38120 PRINT D$;"OPEN "; F$
38140 PRINT D$;"WRITE "; F$
38200 PRINT COUNT
38220 FOR I = 0 TO (COUNT - 1)
38240 PRINT NM$(I): PRINT PD$(I)
: PRINT SD$(I)
38242 PRINT PP(I): PRINT SP(I): PRINT
DV(I): PRINT SH(I)
38260 NEXT
38300 PRINT D$;"CLOSE "; F$
38320 RETURN
40000 REM
    ADD A HOLDING
40080 HOME : VTAB 4
40100 INPUT "NAME "; NM$(COUNT)
40110 PRINT "INPUT DATES IN THE
FORM (MMDDYY)"
40120 NM$(COUNT) = LEFT$ (NM$(CO
UNT),25)
40140 INPUT "PURCH DATE "; PD$(CO
UNT): PD$(COUNT) = LEFT$ (PD
$(COUNT),6)

```

```

40145 PRINT "ENTER A SINGLE BLAN
K IF NOT SOLD"
40150 INPUT "SALE DATE ";SD$(COUNT)
    SD$(COUNT) = LEFT$(SD$(
    COUNT),6)
40160 INPUT "PURCH PRICE ";PP(CO
UNT)
40170 INPUT "SALE PRICE ";SP(COU
NT)
40180 INPUT "DIVIDEND/SHARE ";DV
(COUNT)
40190 INPUT "SHARES ";SH(COUNT)
40300 COUNT = COUNT + 1
40400 RETURN
50000 REM
        WAIT FOR (CR) THEN
50010 REM
        OUTPUT HEADING FOR 'LI
ST'
50020 REM
50100 GOSUB 51000: HOME
50110 PRINT "NAME ";
50120 PRINT "PDATE ";
50130 PRINT "SDATE ";
50140 PRINT "PPRICE ";
50150 PRINT "SPRICE ";
50160 PRINT "DIV "
50170 PRINT
50200 LINE = 2
50300 RETURN
51000 REM
        WAIT FOR (CR) TO BE PR
ESSED
51010 VTAB 23: HTAB 5
51020 PRINT "PRESS 'RETURN' WHEN
READY "
51050 POKE - 16368,0
51100 IF PEEK (- 16384) = 141 THEN
RETURN
51200 GOTO 51100
52000 REM
        WAIT FOR (CR) AND
52020 REM
        PRINT HEADER
52040 REM
        FOR APPRECIATION AND D
IVIDEND
52060 GOSUB 51000: HOME : HTAB 4
52080 PRINT "NAME";: HTAB 14
52100 PRINT "$GAIN";: HTAB 21
52120 PRINT "%GAIN"
52140 PRINT
52160 LINE = 2
52180 RETURN

```

A complete listing of the program is given in listing 4, and a sample of the displayed menu is given in listing 5. The program is fairly well documented, and I hope that the comments, along with the text of this article will enhance the usefulness of the program.

Table 2: Routines and their uses

20000-21999	Appreciation Report
24000-25999	Change an Entry
28000-29999	Estimated Dividends Report
32000-33999	List Securities Entries
36000-37999	Read Securities from Disk
38000-39999	Write Securities to Disk
40000-41999	Add a New Entry
50000-50500	Print Header for List of Securities
51000-51500	Wait for Return to be Pressed
52000-52500	Print Header for Appreciation and dividend

Listing 5

STOCK MANAGER 1.0
BY R. A. GUEST
MENU

ADD HOLDING
APPRECIATION
CHANGE HOLDING
DIVIDENDS
LIST HOLDINGS
READ DATA FILE
WRITE DATA FILE
EXIT

COMMAND: RE
FILE NAME STOCKS EXAMPLE
MBI
CURRENT PRICE 5124.25
TURKEY
CURRENT PRICE 1159.50
4M
CURRENT PRICE 945.75
MENU

ADD HOLDING
APPRECIATION
CHANGE HOLDING
DIVIDENDS
LIST HOLDINGS
READ DATA FILE
WRITE DATA FILE
EXIT

COMMAND:

MICRO

OSI

SOFTWARE FOR OSI

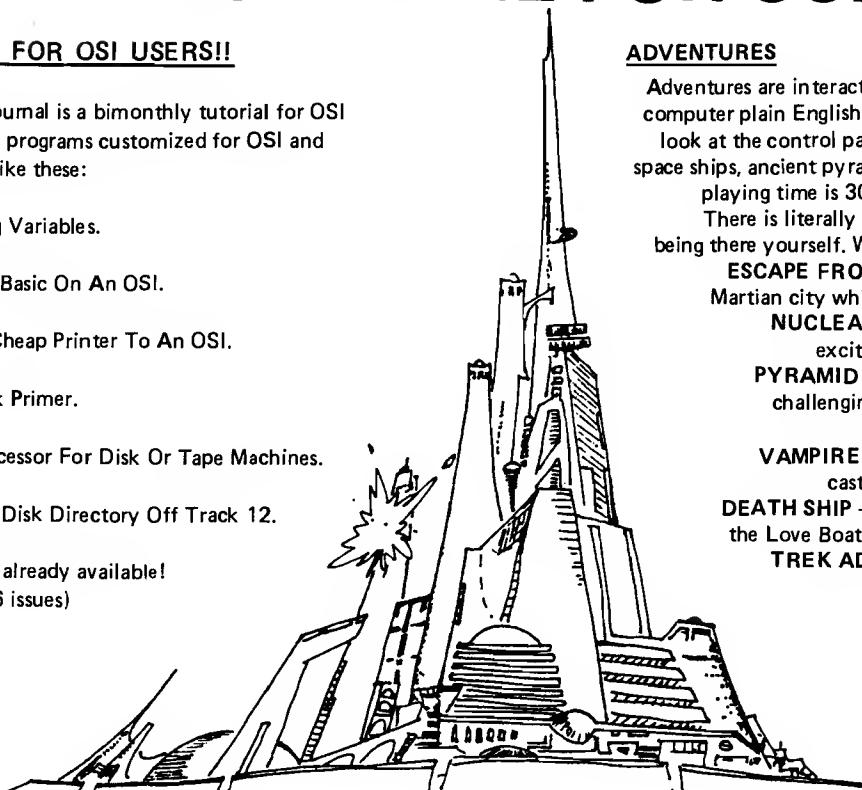
OSI

A JOURNAL FOR OSI USERS!!

The Aardvark Journal is a bimonthly tutorial for OSI users. It features programs customized for OSI and has run articles like these:

- 1) Using String Variables.
- 2) High Speed Basic On An OSI.
- 3) Hooking a Cheap Printer To An OSI.
- 4) An OSI Disk Primer.
- 5) A Word Processor For Disk Or Tape Machines.
- 6) Moving The Disk Directory Off Track 12.

Four back issues already available!
\$9.00 per year (6 issues)



NEW SUPPORT ROMS FOR BASIC IN ROM MACHINES

C1S — for the C1P only, this ROM adds full screen edit functions (insert, delete, change characters in a basic line.), Software selectable scroll windows, two instant screen clears (scroll window only and full screen.), software choice of OSI or standard keyboard format, Bell support, 600 Baud cassette support, and a few other features. It plugs in place of the OSI ROM. NOTE: this ROM also supports video conversions for 24, 32, 48, or 64 characters per line. All that and it sells for a measly \$39.95.

C1E/C2E for C1/C2/C4/CB Basic in ROM machines.

This ROM adds full screen editing, software selectable scroll windows, keyboard correction (software selectable), and contains an extended machine code monitor. It has breakpoint utilities, machine code load and save, block memory move and hex dump utilities. A must for the machine code programmer replaces OSI support ROM. Specify system \$59.95

DISK UTILITIES

SUPER COPY — Single Disk Copier

This copy program makes multiple copies, copies track zero, and copies all the tracks that your memory can hold at one time — up to 12 tracks at a pass. It's almost as fast as dual disk copying. — \$15.95

MAXIPROSS (WORD PROCESSOR) — 65D polled keyboard only - has global and line edit, right and left margin justification, imbedded margin commands, choice of single, double or triple spacing, file access capabilities and all the features of a major word processor — and it's only \$39.95.

P.C. BOARDS

MEMORY BOARDSII — for the C1P. — and they contain parallel ports!

Aardvarks new memory board supports 8K of 2114's and has provision for a PIA to give a parallel port! It sells as a bare board for \$29.95. When assembled, the board plugs into the expansion connector on the 600 board. Available now!

PROM BURNER FOR THE C1P — Burns single supply 2716's. Bare board — \$24.95.

MOTHER BOARD — Expand your expansion connector from one to five connectors or use it to adapt our C1P boards to your C4/BP. — \$14.95.

ARCADE AND VIDEO GAMES

ALIEN INVADERS with machine code moves — for fast action. This is our best invaders yet. The disk version is so fast that we had to add selectable speeds to make it playable.

Tape - \$10.95 — Disk - \$12.95

TIME TREK (8K) — real time Startrek action. See your torpedoes move across the screen! Real graphics — no more scrolling displays. \$9.95

STARFIGHTER — a real time space war where you face cruisers, battleships and fighters using a variety of weapons. Your screen contains working instrumentation and a real time display of the alien ships. \$6.95 in black and white - \$7.95 in color end sound.

MINOS — A game with amazing 3D graphics. You see a maze from the top, the screen blanks, and then you are in the maze at ground level, finding your way through on foot. Realistic enough to cause claustrophobia. — \$12.95

SCREEN EDITORS

These programs all allow the editing of basic lines. All assume that you are using the standard OSI video display and polled keyboard.

C1P CURSOR CONTROL — A program that uses no RAM normally available to the system. (We hid it in unused space on page 2). It provides real backspace, insert, delete and replace functions and an optional instant screen clear.

\$11.95

C2/4 CURSOR. This one uses 366 BYTES of RAM to provide a full screen editor. Edit and change lines on any part of the screen. (Basic in ROM systems only.)

FOR DISK SYSTEMS — (65D, polled keyboard and standard video only.)

SUPERDISK. Contains a basic text editor with functions similar to the above programs and also contains a renumberer, variable table maker, search and new BEXEC* programs. The BEXEC* provides a directory, create, delete, and change utilities on one track and is worth having by itself. — \$24.95 on 5" disk - \$26.95 on B".

AARDVARK IS NOW AN OSI DEALER!

Now you can buy from people who can support your machine.

—THIS MONTH'S SPECIALS—

Superboard II	\$279
C1P Model II	429
C4P	749

... and we'll include a free Text Editor Tape with each machine!

Video Modification Plans and P.C. Boards for C1P as low as \$4.95



This is only a partial listing of what we have to offer. We now offer over 100 programs, data sheets, ROMS, and boards for OSI systems. Our \$1.00 catalog lists it all and contains free program listings and programming hints to boot.

**OSI**

Aardvark Technical Services • 1690 Bolton • Walled Lake, MI 48088
(313) 699-3110 or (313) 624-6316

OSI

Why WAIT?

The WAIT function In the OSI and PET BASICs were Intended for Input/Output use but can have other Interesting applications If you understand how to use It.

Robert L. Elm
446 Rothbury Ave.
Bolingbrook, Illinois 60439

When I first saw the WAIT function I immediately dismissed it as something I had no use for. I don't have a printer and I'm not planning on attaching my C1P to anything else, so why would I ever need WAIT? The answer lies in understanding how the function works. We seldom develop applications for things we don't understand, so what we need is the necessary foundation.

Ohio Scientific's *BASIC in ROM Reference Manual* states that "WAIT I,J,K reads status of memory location I (Decimal) exclusive OR's it with K, then AND's the result with J until a non zero result is obtained. If K is omitted it is zero." That's very nice and to the point but it doesn't tell you anything about how to determine what values should be in J and K. If I want to check a flag word or wait for some other indicator before continuing the program, I may have to detect my indicator in the presence of other changing bits. How can I determine what values should be in WAIT to do that?

The key is in knowing what the exclusive OR can do for you as a programmer. Dr. DeJong recently gave an explanation of each logical function (see MICRO 22:31) but only briefly mentioned the one application we need here. Let's suppose we have an address containing a binary word 11111110 (D.254) and we want to detect if bit 5 changes regardless of what else happens. If only bit 5 changes we would expect a binary 11011110 (D.222), but we can't guarantee only that unique value. Wouldn't it be nice if we could "blind" the machine to the normal contents of the address and then indicate only which bit we are interested in? This is exactly what we can do with the correct values in WAIT. Let's see how.

If we place the address in WAIT as "I" and its normal contents (D.254 in our example) in "K", we will in effect exclusive OR 254 with itself. Using Dr. DeJong's truth tables, what will be the result? Very interesting! If you exclusive OR any value with itself you get all zeros. In other words, the machine is now "blind" to the normal value at the address specified. Just what we wanted!

Next we want to tell it to stop "waiting" if only bit 5 changes. If we put D.32 in the WAIT instruction as "J" (2 to the 5th power is 32), it will be ANDed with the result and continue with the program only if bit 5 changes.

That's great, but is it really necessary to figure the powers of two, etc.? No, but I did want you to understand what was going on. In reality it's quicker to figure the decimal difference between the normal value and the new value we want to watch for. Using our example, $254 - 222 = 32$. That's much easier, especially for figuring combinations of bits.

So what good is it if you don't have a printer? I have already covered one use in a previous article (see "A C1P Users Notebook", MICRO 31:11) to read tapes without loading them into memory. That application didn't use the "K" operator since the ACIA Status Register didn't have any extraneous data to get rid of, and I only needed to know when the Receive Data Register was full.

Recently I found another interesting use for WAIT. It seems that due to the way the circuitry is built for the polled

Table 1

Key	57088 value when depressed	wait until		wait if	
		J	K*	J	K
RPT	126	128	254	128	126
ESC	222	32	254	32	222
L Sh	250	4	254	4	250
R Sh	252	2	254	2	252

*Normal value of 57088 with SHIFT LOCK depressed is 254.

Presenting the CJM Microsystem For the Apple II

The CJM Microsystem for the Apple II

The CJM Microsystem now provides Apple owners with the hardware they need to interface joysticks, sense external inputs, and control other devices such as audio or video recorders. The applications are endless.

Institutional Standards

All metal chassis and heavy duty cables and connectors allow the CJM Microsystem to meet the demands of the educational environment.

A Variety of Applications

The Microsystem can be used for many applications from games to sophisticated computer assisted instruction.

The Microstik can be used for graphics input, menu selection, or any screen oriented function.

The output modules such as the Microbox can run appliances, lamps, motors, relays or other loads from keyboard or program commands. The input modules can sense temperature, light, or

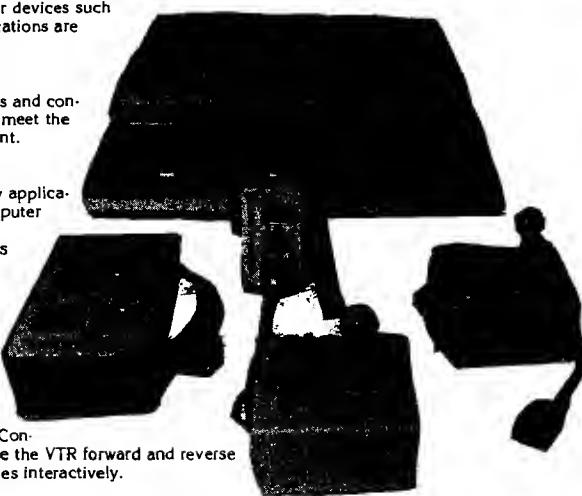
sound to provide external information.

Specialized modules, such as the VTR Controller can sense tape position and drive the VTR forward and reverse utilizing the input and output capabilities interactively.

The Graphics Kit Software

This is a disk based program written in Integer Basic and Assembly Language. It uses the Microstiks to simulate the Apple Graphics Pad and adds some extra features, including:

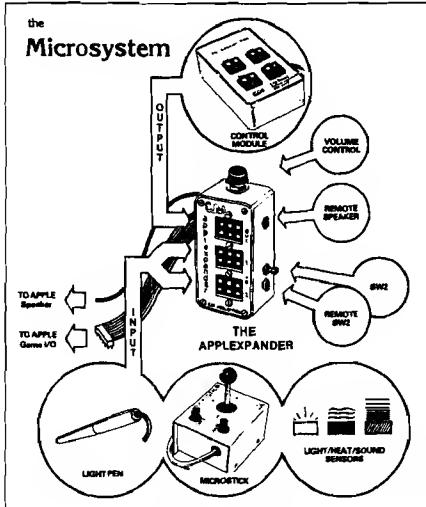
- Draw shapes in 8 modes using Microstiks.
- Draw to both HIRES screens.
- Assemble shapes into tables.
- Select a color from the palette using the Microstik cursor.
- Add text directly to drawings with auto scrolling in either direction.
- Move shapes around the HIRES screens and deposit them at the touch of a button. Press the button again to pick them up and move them to a new location. Press a key to rotate the shape. Press another to bring up the next shape.
- There are more than 50 distinct drawing commands.
- The Animate Command cuts from screen 1 to screen two and back again.
- The Save Command saves either screen for later use in custom programs as charts or graphs (ideal for CAI applications).



USE YOUR MASTERCARD OR VISA CARDS

APPLEXPANDER+S	\$ 54.95
MICROSTIK	\$ 59.95
AC CONTROL BOX	\$ 89.95
RELAY CONTROL BOX	\$ 89.95
LIGHT PEN	\$ 39.95
GRAPHICS KIT SOFTWARE	\$ 49.95
PDL ADAPTER KIT	\$ 14.95

ORDER TODAY 703-820-2444



CJM INDUSTRIES, INC.
P.O. Box 2367
Reston, Virginia
22090

The Applexpander
The APPLEXPANDER is the heart of the CJM MICROSYSTEM. The Applexpander plugs into the Apple Game I/O socket. Once the expander is installed there will never be another need to access the game socket. The expander buffers the input and output signals to the Game I/O. Providing the added safety needed to interface to the outside world.

The two input sockets accept a Microstik, Light Pen or an assortment of input devices such as temperature, audio or light sensors.

The output socket will drive the AC Control Box, Relay Modules, LED Arrays and other controllers.

The APPLEXPANDER+S includes an Auxiliary Speaker/Headphone Jack, and Volume Control. The Apple speaker is automatically muted when a speaker is plugged into the remote jack. The volume control adjusts the sound level. When an external speaker (not included) is used, the sound quality of the Apple increases dramatically.

Microstik
The CJM MICROSTIK is a dual axis joystick. It features an all metal rugged chassis, with a heavy duty cable and Jones plug. Each Microstik includes two pushbuttons for interactive control. Additional circuitry reduces the current draw so that two Microstiks can safely be used simultaneously through the game socket. These are high quality units constructed to withstand abuse. Extension cables are available as accessories.

keyboard, if you PEEK (57088), (actually any address between 56320 and 57343 gives the same results) you will be polling Row 0. This means you don't have to disable Control C and write your own keyboard polling routine if you want a simple response from the operator. I wanted to display eight pages of information and have the computer wait between them until I was ready for the next one. The simple routine XXXX PRINT "Depress ESC to proceed": WAIT 57088,32,254: RETURN works perfectly. And now you know where I got the values for my example.

By rearranging the values it is also possible to wait only if a key is pressed. This would allow a long program such as a data listing to run continuously until you had a reason to stop it. To do this the WAIT is imbedded in the loop so that loop operation is suspended only as long as a particular key remains depressed.

A slight variation of this is to use WAIT 57088,1,255 in a loop. Now the loop can be suspended indefinitely by releasing the SHIFT LOCK key and you don't have to keep one finger on the keyboard.

At this point I must mention the uniqueness of the CTRL key. Due to its use with "CTRL C", 57088 may read either 190 or 255 when it is read. It seems to depend on the kind of instruction preceding the read. I mention this because in some cases WAIT 57088,1,255 will stop the loop forever if the CTRL key is depressed. Personally, I have decided not to use the CTRL key with WAIT so that unnecessary confusion is avoided.

Table 1 shows the WAIT 57088 J and K values for the four usable keys in Row 0. Values are given for both "wait until the key is depressed" and "wait if the key is depressed" applications. You can use any of these keys in the previously described subroutine, or use the values in IF statements to get real-time responses. The values shown assume the SHIFT LOCK key is depressed but according to my tests, it rarely affects operation either way.

With the above information you should be able to use WAIT in many different ways. In fact, grab your computer and try out one of these subroutines right now. Why wait?

MICRO™

An Atari Assembler

This article describes a simple, one-pass assembler written in BASIC for a 16K Atari 400 or 800 computer system.

William L. Colsher
4328 Nutmeg Lane, Apt. 111
Lisle, Illinois 60532

Back in the first year of MICRO, our favorite editors published an article by Michael J. McCann titled "A Simple 6502 Assembler for the PET" (6:17). When I finally broke down and bought a 6502-based Atari 800 (previously I had only used 8080 and Z-80-based machines), I also picked up all the copies of MICRO that I could find. I quickly found McCann's article and decided it would be a good way to learn the Atari BASIC, and master 6502 machine language. The program that accompanies this article is [I think] functionally identical with the original PET version. But... I'm new at 6502 and I could easily have overlooked something.

Six Functions

The assembler presented here has six functions:

1. Input and assemble source code.
2. Save object code on tape.
3. Load object code from tape.
4. Execute the object program.
5. Call the object program as a USR routine.
6. List the object program to the screen.

The careful reader will note that these functions are nearly identical with those of the McCann assembler. Their actual use has been modified only as dictated by differences between the PET and Atari. The following paragraphs describe the use of each of the six functions.

Function 1 allows you to enter your program. Since this is a one-pass assembler you are not allowed symbolic addresses or operands (that is, labels). All addresses and operands must be entered in decimal. For example 100_{16} must be entered as 256.

In addition to the standard 6502 mnemonics, three pseudo-ops have been provided. (Pseudo-ops are instructions to the assembler that do not generate any machine code.)

ORG—tells the assembler where to start putting your program.

DC—places a number from 0 to 255 in the current location.

END—tells the assembler that you are done entering code.

```
10 DIM HX$(2),SX$(1),UN$(1),MN$(1281),BY(256),
   CO$(16),T$(5),M$(5),A$(15),U$(15)
11 DIM B1$(2),B2$(2),B3$(2),AD$(4),S3$(1),
   S2$(1),S$(1),U$(1)
20 FOR E=0 TO 255
30 READ T$:T:MN$(E*5+1)=T$:BY(E)=T:T$= ""
40 NEXT E
50 T$= ""
60 FOR E=1 TO 16
70 READ T$:CO$(E)=T$:T$= ""
80 NEXT E
90 GRAPHICS 0
100 PRINT "1. Input source code and Assemble"
110 PRINT "2. Save Object Code on Tape"
120 PRINT "3. Load Object Code from Tape"
130 PRINT "4. Execute Machine Language Program"
140 PRINT "5. Call Machine Language Program"
145 PRINT " as USR Routine"
150 PRINT "6. List Machine Language Program"
170 INPUT T$:IF (T<=0) OR (T>6) THEN GOTO 170
180 ON T GOSUB 14000,20000,9000,10000,11000,2900
190 GOTO 90
1000 SX=INT(DC/16)
1010 UN=DC-(SX*16)
1020 SX$=CO$(SX+1)
1030 UN$=CO$(UN+1)
1040 HX$(1)=SX$:HX$(2)=UN$
1050 RETURN
```

(continued)

```

2900 GRAPHICS 0
2910 PRINT "Start address";:INPUT AD:I=0
3000 IF I=23 THEN GOTO 5050
3001 I=I+1
3005 IB=PEEK(AD)
3010 TS=MM$(IB+5+1)
3015 IF TS<>"NULL" THEN GOTO 3050
3025 DC=IB:GOSUB 1000:GOSUB 13000
3030 PRINT AD$;" ";HX$;" "
3040 AD=AD+1:GOTO 3000
3050 ON BY(IB) GOTO 3060,3090,4050
3060 DC=IB:GOSUB 1000:GOSUB 13000
3070 PRINT AD$;" ";HX$;" ";TS
3075 AD=AD+1
3080 GOTO 3000
3090 DC=IB:GOSUB 1000
4000 B1$=HX$
4010 DC=PEEK(AD+1):GOSUB 1000
4011 B2$=HX$
4024 GOSUB 13000:P=DC
4030 PRINT AD$;" ";B1$;" ";B2$;" ";TS;
    " ";P
4035 AD=AD+2
4040 GOTO 3000
4050 DC=IB:GOSUB 1000
4060 B1$=HX$
4070 DC=PEEK(AD+1):GOSUB 1000
4080 B2$=HX$
4090 DC=PEEK(AD+2):GOSUB 1000
5000 B3$=HX$
5010 OP=PEEK(AD+1)+(PEEK(AD+2)*256)
5011 GOSUB 13000
5020 PRINT AD$;" ";B1$;" ";B2$;" ";B3$;" ";
    TS;" ";OP
5025 AD=AD+3
5030 GOTO 3000
5050 INPUT TS
5051 IF TS<>" " THEN RETURN
5052 GRAPHICS 0:I=0:GOTO 3000
6000 DATA BRK ,1,ORAIX,2,NULL ,0,NULL ,0,NULL ,0,
    ORAZ ,2,ASL ,2,NULL ,0,PHP ,1
6010 DATA ORAIM,2,ASLA ,1,NULL ,0,NULL ,0,ORA ,3,
    ASL ,3,NULL ,0,BPL ,2,ORAIY,2
6020 DATA NULL ,0,NULL ,0,NULL ,0,ORAZX,2,ASLZX,2,
    NULL ,0,CIC ,1,ORAY ,3
6030 DATA NULL ,0,NULL ,0,NULL ,0,ORAX ,3,ASLX ,3,
    NULL ,0,JSR ,3,ANDIX,2,NULL ,0
6040 DATA NULL ,0,BITZ ,2,ANDZ ,2,ROLZ ,2,NULL ,0,
    PPL ,1,ANDIM,2,ROLA ,1,NULL ,0
6050 DATA BIT ,3,AND ,3,ROL ,3,NULL ,0,BMI ,2,
    ANDIY,2,NULL ,0,NULL ,0,NULL ,0
6060 DATA ANDZX,2,ROLZX,2,NULL ,0,SEC ,1,ANDY ,3,
    NULL ,0,NULL ,0,ANDX ,3
6070 DATA ROLX ,3,NULL ,0,RTI ,1,EORIX,2,NULL ,0,
    NULL ,0,NULL ,0,EORZ ,2,LSRZ ,2
6080 DATA NULL ,0,PHA ,1,EORIM,2,LSRA ,1,NULL ,0,
    JMP ,3,EOR ,3,LSR ,3,NULL ,0
6090 DATA BVC ,2,EORIY,2,NULL ,0,NULL ,0,NULL ,0,
    EORZX,2,LSRZX,2,NULL ,0
6100 DATA CLI ,1,EORY ,3,NULL ,0,NULL ,0,NULL ,0,
    EORX ,3,LSRX ,3,NULL ,0,RTS ,1
6110 DATA ADCIX,2,NULL ,0,NULL ,0,NULL ,0,ADCZ ,2,
    RORZ ,2,NULL ,0,PLA ,1,ADCIM,2
6120 DATA RORA ,1,NULL ,0,JPPI ,3,ADC ,3,ROR ,3,
    NULL ,0,BVS ,2,ADCIY,2,NULL ,0
6130 DATA NULL ,0,NULL ,0,ADCZX,2,RORZX,2,NULL ,0,
    SEI ,1,ADCY ,3,NULL ,0,NULL ,0
6140 DATA NULL ,0,ADCX ,3,RORX ,3,NULL ,0,NULL ,0,
    STAIX,2,NULL ,0,NULL ,0,STYZ ,2
6150 DATA STAZ ,2,STXZ ,2,NULL ,0,DEY ,1,NULL ,0,
    TXA ,1,NULL ,0,STA ,3

```

```

6160 DATA STX ,3,NULL ,0,BCC ,2,STAIY,2,NULL ,0,
    NULL ,0,STYZX,2,STAZX,2,STXZY,2
6170 DATA NULL ,0,TYA ,1,STAY ,3,TXS ,1,NULL ,0,
    NULL ,0,STAX ,3,NULL ,0,NULL ,0
6180 DATA LDYIM,2,LDAIX,2,LDXIM,2,NULL ,0,LDYZ ,2,
    LDAZ ,2,LDXZ ,2,NULL ,0
6190 DATA TAY ,1,LDAIM,2,TAX ,1,NULL ,0,LDY ,3,
    LDA ,3,LDX ,3,NULL ,0,BCS ,2
6200 DATA LDAIY,2,NULL ,0,NULL ,0,LDYZX,2,LDAZX,2,
    LDXZY,2,NULL ,0,CLV ,1
6210 DATA LDAY ,3,TSX ,1,NULL ,0,LDYX ,3,LDAX ,3,
    LDXY ,3,NULL ,0,CPIYIM,2,CMPIX,2
6220 DATA NULL ,0,NULL ,0,CPIYZ ,2,CMPZ ,2,DECZ ,2,
    NULL ,0,INY ,1,CMPIM,2,DEX ,1
6230 DATA NULL ,0,CPIY ,3,CMP ,3,DEC ,3,NULL ,0,
    BNE ,2,CMPIY,2,NULL ,0,NULL ,0
6240 DATA NULL ,0,CMPZX ,2,DECZX,2,NULL ,0,CLD ,1,
    CMPY ,3,NULL ,0,NULL ,0,NULL ,0
6250 DATA CMPX ,3,DECX ,3,NULL ,0,CPXIM,2,SBCIX,2,
    NULL ,0,NULL ,0,CPXZ ,2,SBCZ ,2
6260 DATA INCZ ,2,NULL ,0,INX ,1,SBCIM,2,NOP ,1,
    NULL ,0,CPX ,3,SBC ,3,INC ,3
6270 DATA NULL ,0,BEQ ,2,SBCIY,2,NULL ,0,NULL ,0,
    NULL ,0,SBCZX,2,INCZX,2,NULL ,0,SED ,1
6280 DATA SBCY ,3,NULL ,0,NULL ,0,NULL ,0,SBCX ,3,
    INCX ,3,NULL ,0
6290 DATA 0,1,2,3,4,5,6,7,8,9,A,B,C,D,E,F
9000 GRAPHICS 0
9010 PRINT "Enter Program Name";:INPUT NS
9015 N2$="C":N2$(3)=NS
9020 OPEN #1,4,0,N2$
9030 INPUT #1,ZZ
9040 INPUT #1,EN
9050 FOR AD=ZZ TO EN
9060 INPUT #1,DA
9070 POKE AD,DA
9080 NEXT AD
9090 CLOSE #1
9100 RETURN
10000 GRAPHICS 0
10010 PRINT "Enter Address in Base 10";:INPUT AD
10015 IF AD>65535 THEN GOTO 10000
10020 T99=USR(AD)
10030 RETURN
11000 GRAPHICS 0
11010 PRINT "Enter Value to be passed";:INPUT AC
11020 PRINT "Enter Address in Base 10";:INPUT AD
11050 T99=USR(AD,AC)
11060 RETURN
13000 A=AD:S3=INT(AD/4096)
13002 A=A-S3*4096
13010 S2=INT(A/256)
13012 A=A-S2*256
13020 S=INT(A/16)
13060 U=AD-(S3*4096+52*256+5*16)
13070 S3$=COS$(S3+1)
13080 S2$=COS$(S2+1)
13090 S$=COS$(S+1)
13100 U$=COS$(U+1)
13110 AD$(1)=S3$:AD$(2)=S2$:AD$(3)=S$:AD$(4)=U$:
13120 RETURN
14000 GRAPHICS 0:AD=826:ZZ=826
14010 PRINT "(MNEMONIC)(SPACE)(OPERAND)"
14020 GOSUB 15000
14030 F=0
14040 FOR E=0 TO 255
14041 TS=MM$(E*5+1)
14050 IF TS<>MS THEN GOTO 14060
14051 B=BY(E):F=1:CD=E:E=256
14060 NEXT E
14070 IF F=0 THEN GOTO 14260
14080 ON B GOSUB 14100,14130,14180
14090 GOTO 14020

```

```

14100 POKE AD,CD
14110 AD=AD+1
14120 RETURN
14130 IF OP>255 OR OP<0 THEN PRINT "ERROR - "
OPERAND":RETURN
14140 POKE AD,CD
14150 POKE AD+1,OP
14160 AD=AD+2
14170 RETURN
14180 IF OP>65535 OR OP<0 THEN PRINT "ERROR - "
OPERAND":RETURN
14190 POKE AD,CD
14200 B2=INT(OP/256)
14210 B1=OP-(B2*256)
14220 POKE AD+1,B1
14230 POKE AD+2,B2
14240 AD=AD+3
14250 RETURN
14260 IF (M$="ORG ") OR (M$="END ") OR
(M$="DC ") THEN GOTO 14280
14270 PRINT "ERROR - PSUEDO-OP":STOP
14280 IF M$="ORG " THEN GOTO 14300
14290 GOTO 14340
14300 IF F0=1 THEN PRINT "ERROR - MULTIPLE
ORG":GOTO 14020
14310 F0=1
14320 AD=OP:ZZ=OP
14330 GOTO 14020
14340 IF M$="END " THEN GOTO 14360
14350 GOTO 14480
14360 EN=AD-1
14370 RETURN

```

```

14480 POKE AD,OP
14510 AD=AD+1
14520 GOTO 14020
15000 M$="":A$="":INPUT A$
15010 IF LEN(A$)<3 THEN PRINT "ERROR - LENGTH":
GOTO 15080
15030 S=0:FOR M=1 TO LEN(A$)
15040 U$=A$(M):IF U$=" " THEN S=M:M=LEN(A$)
15050 NEXT M
15060 IF S=0 THEN GOTO 15100
15070 FOR M=1 TO S-1:U$=A$(M):M$(M)=U$:NEXT M
15072 IF S=6 THEN GOTO 15080
15074 FOR M=S TO 5:M$(M)=" ":NEXT M
15080 U$="":U$=A$(S):OP=VAL(U$)
15090 RETURN
15100 S=LEN(A$)+1
15110 FOR M=1 TO S-1:U$=A$(M):M$(M)=U$:NEXT M
15120 IF S=6 THEN GOTO 15090
15130 FOR M=S TO S:M$(M)=" ":NEXT M:GOTO 15090
20000 GRAPHICS 0
20010 PRINT "Enter Program Name":INPUT N$
20015 N2$="C":N2$(3)=N$"
20020 OPEN #1,8,0,N2$
20030 PRINT #1,ZZ
20040 PRINT #1,EN
20050 FOR AD=ZZ TO EN
20060 DA=PEEK(AD)
20070 PRINT #1,DA
20080 NEXT AD
20090 CLOSE #1
20100 RETURN

```

Function 2 allows you to save your program on tape. When you select this function you will be asked for the name you wish to save the program under. The console will beep twice and when you press RETURN your program will be saved on tape. (Disk owners will find it quite simple to alter this section of the assembler to save programs on disk.)

Function 3 is the opposite of function 2; it loads your program from tape. Once again you will have to enter a program name. If the program name you have entered is not found on the tape or disk an error will result.

Functions 4 and 5 allow you to execute your machine language object program. Function 4 simply jumps to the starting address you have entered. Function 5 allows you to pass a value to your program. Rather than confuse you about how this is done I'll refer you to the *Atari BASIC Reference Manual* for details.

Finally, function 6 allows you to list your program after it has been entered. This routine is actually a disassembler and you can use it to snoop around in Atari's ROMs just as easily. This function will display a screenful of disassembled code and then halt. To continue the listing press any key and RETURN. To halt, and go back to the main menu, simply press RETURN.

Some Changes to the Program

Since getting the listing presented here I have discovered that a couple of changes are in order.

Add line 12.

12 DIM N\$(8),N2\$(10)

This makes the entering of program names work correctly.

It is helpful to know where you can safely put information and programs in-

to your machine's memory. In low memory it appears that these areas are free:

21-64 (All addresses are in decimal)

252-563

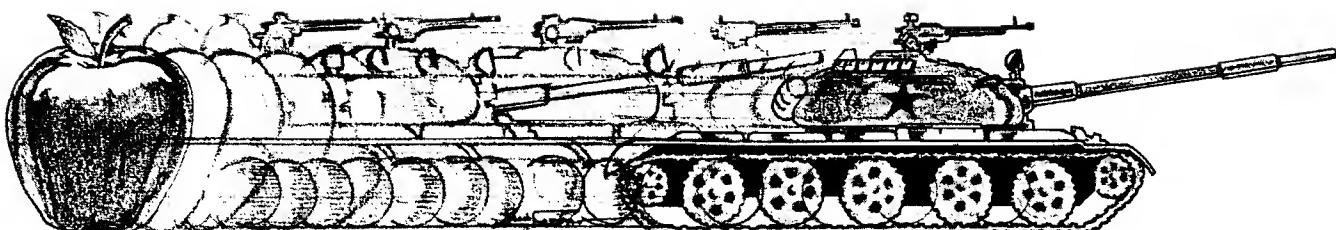
713-740

1664-1791

Take reasonable care with where you put things and you should be OK.

William L. Colsher took an undergraduate major in Computer Science at Ohio State University. He worked for several years in mainstream data processing, leaving that field three years ago to write and consult in the microcomputer field. He is presently manager of the Oak Brook Computer Centre in Oakbrook Terrace, Illinois. He owns several small computer systems including a fully expanded TRS-80 Model I and a similarly configured Atari 800.

MICRO™



HOW TO TURN AN APPLE INTO A TANK.

With **Computer Conflict**™ and a little imagination, we'll transform your staid and respectable Apple computer into the fearsome war machine of the Soviet Red Army. Computer Conflict actually consists of two fast-paced, action-packed war games played on full-color mapboards of Hi-Res graphics: **Rebel Force** and **Red Attack**.

REBEL FORCE puts you in the role of a Soviet commander whose regiment must face a computer-directed guerrilla uprising which has overrun a vital town. Armed with your tank, heavy-weapons, and infantry units, your mission is to regain the town through the annihilation of the Rebel Force.

Your advance will be brutally opposed by minefields, ambushes, militia, and anti-tank guns — all skillfully deployed by your computer. Survival and success of your units will depend on your ability to take advantage of the variable terrains — open, forest, and rough — each of which has different movement costs and shelter values.

In this finely-balanced solitaire wargame, every move is played under real-time conditions: Procrastinate and lose. At

the same time, caution cannot be cast aside; severe unit losses will only result in a Pyrrhic victory at best.

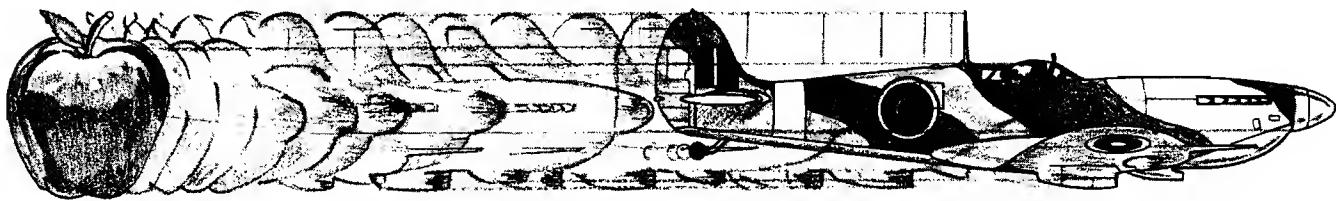
With its five levels of difficulty (plus one where you make up your own), the computer can and will stress your tactical skills to their fullest.

RED ATTACK! simulates an invasion by a mixed Soviet tank and infantry force against a defending battalion. As the defender, your task is to deploy your infantry units effectively to protect three crucial towns — towns that must not fall!

As the Russian aggressor, your objective is to crush the resistance by taking two of these three towns with your tanks and infantry. With control of these strongpoints, the enemy's capitulation is assured.

Red Attack is a two-player computer simulation of modern warfare that adds a nice touch: At the start of each game, the computer displays a random setup of terrains and units, providing every game with a new, challenging twist.

Computer Conflict, for \$39.95, comes with the game program mini-disc and a rule book.



OR A SPITFIRE.

After you're done playing Computer Conflict, you may be in a mood for something other than ground-attack wargames. In that case, **Computer Air Combat**™ is just what you need.

With Computer Air Combat, your screen lights up with an open sky generated by Hi-Res graphics offering global and tactical plots. Squint your eyes a bit, let loose your mind, and you'd swear your keyboard has melted into the throttle, rudder, altimeter, and other cockpit instrumentation of a World War II combat plane. In fact, any of 36 famous fighters or bombers, from a Spitfire and B-17 Flying Fortress to the Focke-Wulf 190 and A6M5 Zero. Each plane is rated — in strict historical accuracy and detail — for firepower, speed, maneuverability, damage-tolerance, and climbing and diving ability.

Practically every factor involved in flying these magnificent airplanes has been taken into account, even down (or up?) to the blinding sun. Climb, dive, twist, and turn. Anything a real plane can do, you can do. However, the computer prevents all "illegal" moves — such as making an outside loop (which in real life, would disastrously stall a plane).

PLAY THE COMPUTER. Aside from being the game's perfect administrator and referee, the computer will serve as a fierce opponent in the solitaire scenarios provided: Dogfight, Bomber Formation, radar-controlled Nightfighter, and V-1 Intercept. There's even an Introductory Familiarization Flight (with Air Race option) to help you get off the ground.

With the number and type of planes and pilot ability variable, you can make the computer as challenging as you want to give you the ultimate flying experience.

PLAY A HUMAN. Two can play this game as well, in dogfights and bomber attacks. Given a handicap of more or better planes or an ace pilot (or all of the above), even a novice at Computer Air Combat stands a chance to defeat a battle-hardened veteran.

For \$59.95, Computer Air Combat gives you the game disc, a rule book, two mapboard charts (for plotting strategies between moves), and three player-aid charts.

Credit card holders, if you own an Apple® II 48K (Apple-soft ROM) and a mini-floppy disc drive, call 800-227-1617 ext. 335 (toll free) and charge your order to your VISA or MASTERCHARGE. In California, call 800-772-3545, ext. 335.

To order by mail, send your check to:
Strategic Simulations Inc., Dept. PC, 465 Fairchild Drive, No. 108, Mountain View, CA 94043. All our games carry a 14-day money back guarantee to assure your satisfaction.

While you're at it, you can also get our other games:

- Computer Bismarck** for your Apple: \$59.95
Computer Bismarck, TRS-80® 48K Disc: \$59.95
Computer Bismarck, TRS-80 32K Cassette: \$49.95
- Computer Ambush** (a tactical simulation of man-to-man combat in WWII) for your Apple: \$59.95
- Computer Napoleonics**, the Battle of Waterloo for your Apple: \$59.95
- Computer Quarterback** (a real-time strategy football game): \$39.95

Turning USR(X) Routines Into BASIC DATA Statements

This program saves machine language routines as BASIC DATA statements. It also includes a hexadecimal to decimal converter.

Thomas Cheng
26 Madison Street Apt. 41
New York, New York 10038

If for any reason you are writing machine language subroutines for the Ohio Scientific C1P (or any other cassette Ohio Scientific machine), the first problem which will present itself is the lack of any method of saving the routine. An alternative to spending 5 to 10 minutes for the ASSEMBLER or the EXTENDED MONITOR to load in, then save using that, is to turn the routine into a series of DATA statements in BASIC. To reload these

values, you would then load the DATA statements into program memory, then POKE them into the proper memory locations.

For example, if I add a machine language subroutine fifty bytes in length, the program would save: first, a line number followed by the DATA keyword, then the actual program in decimal format. The first such line saved will contain the two pointers for the location of the program in decimal format. I chose to output these numbers separately, so that I could easily change them.

The following is an illustration of the workings of the program.

```
FOR K=0 to 63:POKE  
    K+4096,K: NEXTK  
    RUN  
    START,END? 4096, 4157  
    LINENO, INC? 10,10
```

Result

10 DATA	4096,4157
20 DATA	0,1,2,3,4,5,6,7,8,9,10, 11,12,13,14,15
30 DATA	16,17,18,19,20,21,22, 23,24,25,26,27,28,29, 30,31
40 DATA	32,33,34,35,36,37,38, 39,40,41,42,43,44,45, 46,47
50 DATA	48,49,50,51,52,53,54, 55,56,57,58,59,60,61, 62,63

This is what the BASIC program should do, but due to the fact that I am extremely lazy, I have added in several frills to the program.

First and most important, is a hexadecimal to decimal converter inherent in the program. This conversion routine is located at lines 140 to 160, inclusive. This little routine has turned out to be quite handy, as I have used it

```
5 REM MACHINE LANGUAGE SAVE  
7 REM ***THOMAS CHENG***  
10 INPUT"START, END";B$,C$: INPUT"LINENO, INC";ST,IN  
20 IFLEFT$(B$,1)="$"THENGOSUB140:B=A:GOTO40  
30 B=VAL(B$):REM IT ALWAYS ENDS UP IN B  
40 B$=C$: IFLEFT$(B$,1)="$"THENGOSUB140:GOTO55  
50 A=VAL(C$):REM-A IS SECOND VALUE  
55 SAVE:PRINT:PRINT:PRINTST;"READN,N2:FORK=NTON2:READQ:POKEK,Q:NEXTK"  
60 ST=ST+IN:PRINTST;"Q=INT(N/256):POKE12,Q:POKE11,N-Q*256"  
70 ST=ST+IN:PRINTST;"DATA";MID$(STR$(B),2);";";MID$(STR$(A),2)  
80 ST=ST+IN:C=B+15:PRINTST;"DATA";:IFC>ATHENC=A  
90 FORK=BTOC:LO=PEEK(K):GOSUB170:PRINTA$::IFK<CTHENPRINT",";  
110 NEXTK  
120 IFCK>ATHENC=B+1:PRINT:GOTO80  
130 PRINT:PRINT:PRINT:POKE517,0:END  
140 A=0:A$="0123456789ABCDEF":FORK=1TOLEN(B$):FORL=1TO16  
150 IFMID$(B$,K,1)=MID$(A$,L,1)THEN A=A+(16↑(LEN(B$)-K)*(L-1))  
160 NEXTL:NEXTK:RETURN  
170 A$=MID$(STR$(LO),2):RETURN
```

OHIO SCIENTIFIC

SUPERBOARD II \$ 279.00
 610 BOARD 8K \$ 279.00
 620 BOARD \$ 99.00
 (OSI BUS FOR 610)
 630 BOARD \$ 225.00
 (ADDS COLOR ETC.)
 C4P series 2 \$ 859.00
 C8P-DF-32K \$2939.00
 AC20 COLOR MONITOR
 10 in.-NOT A TV-\$399.00

VISA, MASTERCHARGE-O.K.

SHIPPING AND INS. CHARGE
 ADDED TO CREDIT ORDERS.
 CHECKS MUST CLEAR BANK
 BEFORE SHIPMENT: NO COD.

E&I TECHNICAL SERVICE
 5300 PARIS GRAVEL RD
 HANNIBAL, MO. 63401
 314-248-0084

OHIO SCIENTIFIC

TOUCH TYPING - 15 lesson set teaches you to use all letters and numerals without the need to look at the keyboard. Requires 32x64 display. 8K. \$19.95.

FAILSAFE +2 - a sophisticated game based on the electronic warfare environment encountered by aircraft during nuclear war. 8K. \$8.95.

INTELLEGENT TERMINAL EMULATOR - down load, edit, then send files back to host computer. Full or half duplex, many other features. Disk systems. \$24.95.

DS-PORT - 18 page data sheet shows how to add parallel ports to your C1P without a 610 board. Includes photo positives. \$9.95.

DS-20MA - Your C1P can use any ASCII 110 baud, 20MA periferal with the aid of this 14 page data sheet. \$8.95.
 Send for a FREE complete software and hardware catalog.

Aurora Software Associates
 P.O. Box 99553
 Cleveland, Ohio 44199
 (216) 221-6981

in several programs I have written. The routine expects the value that is to be converted to be passed in B\$. (This is the reason for so much confusion in lines 20-50. First, the value is placed in B\$, then B\$ is tested for a dollar sign. If the first character of the string is a dollar sign, the value is assumed to be in hexadecimal, then converted to decimal. The test is separate for each value, a worthwhile touch.)

The routine uses the mathematical definition of a base; that is, the sum of sixteen raised to the power of the digit's place (0, 1, 2...) multiplied by the value of the digit itself, (1 for 1, 2, for 2,...10 for A, 11 for B) for all the digits of the number.

The hexadecimal number by my method would be equal to $(16^{**2})(10) + (16^{**1})(1) + (16^{**0})(11) = 2560 + 16 + 11 = 2587$ in base 10.

Other little touches are contained in lines 55-60. Line 55 will output the requisite BASIC commands to POKE the statements into memory. Line 60 will set the values of the locations 11 and 12 as a pointer to the first byte of the subroutine, in standard 6502 format. That is, least significant byte first.

Line 70 produced the beginning and ending locations of the subroutine, while the actual core of the program is located at lines 80-130, with line 170 serving as a subroutine to strip off the extra space which is usually found in front of any number being printed out.

Two Last Notes

After the inquiry in line 10 for the starting line number, the user should turn on his recorder for the following DATA statements. Secondly, this program will turn out sixteen values per line of DATA statement. Occasionally, the numbers being printed out will run over the maximum line length of 72 characters, so the statement C = B + 15 in line 80 should be changed. The increment of 15 should be change to the true increment minus one.

Happy computing... and take a PEEK at some machine language routines!

MICRO™

NEW!

FROM Brøderbund Software
 STRATEGY GAMES!



THE SAGA CONTINUES . . .
 IV TAWALA'S LAST REDOUBT

The cruel Emperor Tawala has been forced from his throne on the world of Galactica and has fled for his life to the planet of Farside, where he and a small band of adherents prepare to make their last stand. Extreme solar conditions have isolated Farside from the rest of the galaxy, and so it remains to Benth, leader of the local Insurrectionists, to press the final assault on Tawala and his minions.

TAWALA'S LAST REDOUBT puts you in the position of rebel leader. You must intercept and decipher Tawala's secret messages to his supporters, form alliances with local chiefs, detect Tawala's spies in your midst, separate hard intelligence from enemy disinformation, avoid Tawala's military forays against you and, finally, lead the assault against the Prince's stronghold.

Minimum Configuration:

TRS-80 Cassette, 16K, Level II, \$19.95
 TRS-80 Disk, 32K, \$24.95

APPLE Disk, 48K with APPLESOFT, \$29.95

"Apple, Apple II Plus and Applesoft are trademarks of Apple Computer Co. TRS-80 is a trademark of Radio Shack."



APPLE
 GALAXIAN

Apple Galaxian — In brilliantly colored array, the Galaxians swoop down from all sides in dazzlingly swift attacks to do battle upon the lone defender. This faithful rendition of that most popular of all bar games may drive you around the bend, but think of all the quarters you'll be saving! Apple II Integer or Plus, 48K disk, \$24.95.

 How to order: Ask your dealer or send check or money order for the exact retail price to:



Brøderbund Software

Box 3266, Eugene, Oregon 97403

Call (503) 343-9024 to order. NO CHARGE
 FOR SHIPPING AND HANDLING!
 Visa and Mastercard accepted.

We've got more! Send for our free catalog!

Improved Dual Tape Drive for SYM BASIC

These utility routines occupy less than one page of memory. However they greatly enhance the use of two cassettes, including the ability to automatically duplicate a tape full of BASIC programs.

George Wells
1620 Victoria Pl.
La Verne, California 91750

This article is an update to a previous article of mine which appeared in the November 1979 issue of MICRO (18:5). If you have that issue available you might want to review it, but it's not absolutely necessary since this article presents all new material and does not require any information contained in the original article. You may be wondering why the need for an "improved" article; why didn't I do it right the first time? Basically there are two reasons: Synertek System's new monitor 1.1 ROM and their Resident Assembler/Editor ROMs, both of which became available after I wrote the original article.

MON 1.1 indicates the ID of the tape file being loaded on the left-most digit of SYM's LED display; a very minor change from MON 1.0 but one

that allows the program which called the tape load routine to determine the ID of the file just loaded. This is significant because it frees us from the drudgery of manually duplicating a tape full of BASIC programs by typing LOAD A, SAVE A, LOAD B, SAVE B, etc., as in the original article. By contrast, this article presents a program that will do this automatically, similarly to the way RAE-1 duplicates its tape files. Another advantage of this change is the ability of the calling program to provide true dual cassette control for BASIC programs. In the original article, the remote control for the write-only recorder will be turned on if the first file encountered during a load sequence is not the one asked for. Usually this won't matter since you don't normally have a tape ready to be written in the write-only recorder, but when you do, it's nice to have this added improvement.

RAE-1 provides for a second cassette control—but wouldn't you know—it requires a different port bit than the one I used originally (active low on PB7 of VIA #1 instead of active high on PB4 of VIA #3). If you have not yet implemented this second tape control, Synertek Systems Technical Note #101 describes one way to do it using relays. The program described here uses the same control as RAE-1, but since it does not require the RAE-1 ROMs, you can customize it to any control by modifying the TAPE.OFF.C and TAPE.ON.C routines.

The program presented in this article contains three entry points. The first one is used at the monitor level and approximates the .L2 command with zero, one or three parameters. It is called instead with .L3 and turns on the second recorder for loading hi-speed

tape files. It can also be called as .U0, especially from the on-board hex keypad (USR 0). The second entry point is used while in BASIC and is called by a LOAD command. The third entry point is called from the monitor with .G 1F7B (or .G F7B for 4K) and is used to duplicate a tape of BASIC programs. Detailed instructions for each of these follows, but it is assumed that you have already loaded the OBJECT CODE into memory. If you don't have 8K of RAM then you will have to change the ten "1F" bytes to "0F" when you load it into a 4K system starting at \$0F01. This can be done easily by first Depositing and Verifying the OBJECT CODE at \$F01 and then doing a .M 1F,F01-FFF followed by ten sets of 0FG (no < CR >'s). Verify checksum should then be 6DBA instead of 6E5A. The best arrangement is to put the code in your own PROM along with the appropriate automatic initialization code (not described here).

Using the .L3 Command

Step 1: Enter the following monitor command once after every reset:

.SD 1F11,A66D (or .SD F11,A66D for 4K.)

Step 2: Put a tape in the read-only recorder and press the play button. Use .L3 instead of .L2 and enter the parameters just as for .L2.

Note: If you enter only one parameter, the control for the write-only recorder will be energized after the first file has passed, if it is not the one specified in the parameter ID. This is unavoidable without completely rewriting the monitor tape load routine. Just don't turn on your write-only recorder when loading tape files from the monitor.

DUAL CASSETTE TAPE DRIVE FOR SYM-1 BASIC

BY GEORGE WELLS OCTOBER 4, 1980

HARDWARE REQUIREMENTS:

SYM-1 WITH MON 1.1 ROM.
8K RAM (CAN BE RELOCATED FOR 4K; SEE TEXT).
BASIC V1.1 ROM.
WRITE-RECORDER WITH STANDARD CONTROL.
READ-RECORDER CONTROLLED BY LOW SIGNAL ON
PB7 OF VIA #1 (SAME AS RAE-1 REQUIRES).
TERMINAL.
RAE-1 V1.0 ROM OPTIONAL.

*** ZERO PAGE DEFINITIONS ***

SUP.PRINT	.DE \$17	MS BIT SET SUPPRESSES PRINT
CRLF.NULLS	.DE \$18	NUMBER OF CR/LF NULLS
PRINT.POS	.DE \$19	CURRENT COLUMN PRINT POSITION
WIDTH	.DE \$1A	MAXIMUM WIDTH OF PRINT LINE
P1C	.DE \$1C	COPY OF PARAMETER 1 (ID)
BUFAID	.DE \$FE	MONITOR TAPE ROUTINE BUFFER ADDRESS

*** I/O PORT DEFINITIONS ***

DR1B	.DE \$A000	DATA REGISTER FOR TAPE CONTROL
DDR1B	.DE \$A002	DIRECTION REGISTER FOR TAPE CONTROL
DIG	.DE \$A400	DATA REGISTER FOR DISPLAY DIGIT
DDRDIG	.DE \$A401	DIRECTION REGISTER FOR DIGIT

*** SYSTEM RAM DEFINITIONS ***

TAPDEL	.DE \$A630	TAPE DELAY LOCATION
P1	.DE \$A64E	TAPE ID PARAMETER
P2	.DE \$A64C	TAPE START ADDRESS
P3	.DE \$A64B	TAPE STOP ADDRESS + 1
PARNR	.DE \$A649	NUMBER OF PARMs IN MONITOR COMMAND

*** MONITOR 1.1 ROM DEFINITIONS ***

INCP3	.DE \$8293	INCREMENT PARAMETER 3
CONFIG	.DE \$89A5	CONFIGURE DISPLAY I/O
LOADT	.DE \$8C78	LOAD TAPE ENTRY POINT
EX10	.DE \$8D4E	STOP TAPE EXIT
START	.DE \$8DA9	INITIALIZE AND START TAPE
DUMPT	.DE \$8E87	DUMP TAPE ENTRY POINT
ACCESS	.DE \$8B86	UNWRITE-PROTECT SYSTEM RAM

*** BASIC V1.1 ROM DEFINITIONS ***

1F4A- 48	PHA	
1F4B- 20 01 1F	JSR TAPE.OFF.C	TURN OFF READ-RECORDER
1F4E- 68	PLA	
1F4F- 60	RTS	

*** TO ACTIVATE BASIC LOAD USE 7937 MEMORY SIZE AND
*** ENTER: POKE 202,80: POKE 203,31

1F50- AE 4E A6	BASIC.LOAD LDX P1	GET DESIRED ID
1F53- 86 1C	STX ♦P1C	SAVE IT
1F55- F0 DF	BEQ LOAD.TAPE	BRANCH IF ID = 0
1F57- E8	INX	
1F58- F0 DC	BEQ LOAD.TAPE	BRANCH IF ID = \$FF
1F5A- 20 BA 1F	BASIC.LOOP JSR LOAD.ANY	ELSE LOAD ANY FILE
1F5D- F0 0A	BEQ BASIC.DONE	BRANCH IF "CR" ABORT
1F5F- 49 80	EDR #\$80	TEST FOR "END" TOKEN
1F61- F0 06	BEQ BASIC.DONE	BRANCH IF SO
1F63- 49 80	EDR #\$80	RESTORE ID
1F65- 45 1C	EDR ♦P1C	TEST FOR DESIRED ID
1F67- D0 F1	BNE BASIC.LOOP	BRANCH IF NOT
1F69- 60	BASIC.DONE RTS	CARRY SET MEANS BAD LOAD
1F6A- 00	ZERO.TABLE .BY 0	\$FLAG TO SUPPRESS BASIC PRINT
1F6B- 01	.BY 1	NUMBER OF CR/LF NULLS
1F6C- 00	.BY 0	COLUMN PRINT POSITION
1F6D- 48	.BY 72	TERMINAL PRINT WIDTH
1F6E- A2 03	DUP.INIT LDX #3	COPY FOUR BYTES FROM
1F70- BC 6A 1F	DUP.I.LOOP LDY ZERO.TABLE,X	TABLE TO
1F73- 94 17	STY ♦SUP.PRINT,X	PAGE ZERO
1F75- CA	DEX	FOR BASIC PRINT CONTROL
1F76- 10 F8	BPL DUP.I.LOOP	
1F78- 4C 86 8B	JMP ACCESS	ENABLE SYSTEM RAM & RETURN
; *** TO DUP A BASIC PROGRAM TAPE ENTER .G 1F7B		
; *** SEE TEXT FOR ADDITIONAL INFORMATION		
1F7B- 20 6E 1F	DUP.LEADER JSR DUP.INIT	INITIALIZE PRINT CONTROL
1F7E- A2 0A	LDX #10	FIRST FILE HAS LONG LEADER
1F80- 8E 30 A6	DUP.LOOP STX TAPEDEL	UPDATE TAPE DELAY
1F83- 20 BA 1F	DUP.LOAD JSR LOAD.ANY	GET NEXT FILE FROM MASTER
1F86- 90 18	BCC DUP.GOOD.L	BRANCH IF GOOD LOAD
1F88- 00	BRK	ELSE BREAK TO MONITOR
1F89- 20 6E 1F	DUP.MIDDLE JSR DUP.INIT	ENTRY TO RETURN FROM BREAK
1F8C- AA	TAX	TEST FOR ID = 0
1F8D- F0 F4	BEQ DUP.LOAD	BRANCH IF SO
1F8F- 85 1C	STA ♦P1C	ELSE SEARCH FOR ID = ACC
1F91- 20 BA 1F	DUP.REGET JSR LOAD.ANY	GET NEXT FILE FROM MASTER
1F94- D0 04	BNE DUP.NOABRT	BRANCH IF NOT "CR" ABORT
1F96- 00	BRK	ELSE BREAK AGAIN TO MONITOR
1F97- 20 6E 1F	JSR DUP.INIT	INITIALIZE PRINTER CONTROL
1F98- B0 F5	DUP.NOABRT BCS DUP.REGET	BRANCH IF BAD LOAD
1F9C- C5 1C	CMP ♦P1C	TEST FOR DESIRED ID
1F9E- D0 F1	BNE DUP.REGET	BRANCH IF NOT
1FA0- 8D 4E A6	DUP.GOOD.L STA P1	PASS ID TO SAVE ROUTINE
KEY.WORDS .DE \$C089 TABLE OF BASIC KEY WORDS		
PRINT.SP .DE \$C971 BASIC PRINT SPACE		
PRINT.? .DE \$C974 BASIC PRINT QUESTION MARK		
BASIC.PRNT .DE \$C976 BASIC PRINT CHARACTER IN ACC		
; *** RESIDENT ASSEMBLER/EDITOR ROM DEFINITIONS ***		
; NOTE:		
; THE FOLLOWING TWO ROUTINES CAN BE USED		
; INSTEAD OF TAPE.OFF.C AND TAPE.ON.C		
; IF RAE-1 V1.0 IS ALSO AVAILABLE.		

(continued)

	TAPE.OFF	.DE \$E318	TURN OFF SECOND RECORDER
	TAPE.ON	.DE \$E32A	TURN ON SECOND RECORDER
		.BA \$1F01	
		.OS	
1F01- AD 00 A0	TAPE.OFF.C	LDA DR1B	TURN OFF READ-ONLY RECORDER
1F04- 09 80		ORA #%10000000	
1F06- D0 05		BNE TAPE.CNTRL	(ALWAYS)
1F08- AD 00 A0	TAPE.ON.C	LDA DR1B	TURN ON READ-ONLY RECORDER
1F0B- 29 7F		AND #%01111111	
1F0D- 8D 00 A0	TAPE.CNTRL	STA DR1B	
1F10- 60		RTS	
		;	*** L3 COMMAND SIMULATES L2 WITH SECOND RECORDER.
		;	*** TO ACTIVATE ENTER: .SD 1F11,A66D
1F11- C9 14	L3.COMMAND	CMP #\$14	TEST FOR L3 HASH CODE
1F13- D0 14		BNE L3.ERROR	BRANCH IF NOT
1F15- AE 49 A6		LDX PARMR	GET NUMBER OF PARAMETERS
1F18- F0 1A		BEQ LOAD.HI.SP	BRANCH IF NO PARAMETERS
1F1A- E0 02		CPX #2	TEST FOR 2 PARAMETERS
1F1C- F0 0B		BEQ L3.ERROR	BRANCH IF SO
1F1E- B0 0B		BCS LOAD.3PARM	ELSE BRANCH IF 3 PARAMETERS
1F20- AE 4A A6		LDX P3	ELSE PUT SINGLE PARAMETER
1F23- 8E 4E A6		STX P1	WHERE IT BELONGS
1F26- E8		INX	TEST FOR PARAMETER ID = \$FF
1F27- D0 0B		BNE LOAD.HI.SP	BRANCH IF NOT
1F29- 38	L3.ERROR	SEC	ELSE SET ERROR FLAG AND
1F2A- 60		RTS	RETURN TO MONITOR
1F2B- AE 4E A6	LOAD.3PARM	LDX P1	TEST FOR PARAMETER ID = \$FF
1F2E- E8		INX	
1F2F- D0 F8		BNE L3.ERROR	BRANCH IF NOT
1F31- 20 93 82		JSR INCP3	ELSE INCREMENT PARAMETER 3
1F34- A0 80	LOAD.HI.SP	LDY #\$80	HI SPEED TAPE LOAD ENTRY
1F36- 20 A9 8D	LOAD.TAPE	JSR START	INITIALIZE TAPE ROUTINE
1F39- 20 4E 8D		JSR EX10	TURN OFF WRITE-RECORDER
1F3C- AD 02 A0		LDA DDR1B	SET READ-RECORDER CONTROL
1F3F- 09 80		ORA #%10000000	BIT TO OUTPUT
1F41- 8D 02 A0		STA DDR1B	
1F44- 20 08 1F		JSR TAPE.ON.C	TURN ON READ-RECORDER
1F47- 20 7B 8C		JSR LOADT+3	CONTINUE TO LOAD TAPE
1FA3- 48		PHA	SAVE ID FOR LATER TEST
1FA4- A9 02		LDA #2	ALL PROGRAMS START AT \$0201
1FA6- 8D 4D A6		STA P2+1	TAPE START ADDRESS HI = 2
1FA9- 4A		LSR A	CHANGE 2 TO 1
1FAA- 8D 4C A6		STA P2	TAPE START ADDRESS LO = 1
1FAD- A0 80		LDY #\$80	SET HI SPEED TAPE MODE
1FAF- 20 87 8E		JSR DUMPT	SAVE FILE ON WRITE-RECORDER
1FB2- A2 04		LDX #4	SET TAPE DELAY TO DEFAULT
1FB4- 68		PLA	GET TAPE FILE ID
1FB5- 49 80		EOR #\$80	TEST FOR "END" TOKEN
1FB7- D0 C7		BNE DUP.LOOP	BRANCH IF NOT
1FB9- 60		RTS	RETURN TO MONITOR (CARRY=0)

1FBA- A9 00	LOAD.ANY	LDA #0	SET UP TO GET ANY FILE
1FBC- 8D 4E A6		STA P1	FROM TAPE
1FBF- 20 34 1F		JSR LOAD.HI.SP	HI SPEED MODE ONLY
1FC2- 90 04		BCC LOAD.GOOD	BRANCH ON GOOD LOAD
1FC4- 49 8C		EDR #\$8C	IF ABORT, RETURN ID = \$00
1FC6- F0 37		BEQ LOAD.DONE	AND TAKE BRANCH
1FC8- 08	LOAD.GOOD	PHP	SAVE CARRY
1FC9- 4E 01 A4		LSR DDIRDIG	CHANGE FROM \$FF TO \$7F
1FCC- AD 00 A4		LDA DIG	GET 7 LS BITS OF ID
1FCF- 0A		ASL A	
1FD0- EE 01 A4		INC DDIRDIG	CHANGE FROM \$7F TO \$80
1FD3- 0E 00 A4		ASL DIG	GET MS BIT OF ID
1FD6- 6A		RDR A	COMBINE ALL 8 BITS OF ID
1FD7- 48		PHA	SAVE ID FOR LATER
1FD8- 49 80		EDR #>10000000	CHANGE MSB FOR LATER BRANCH
1FDA- 30 10		BMI LOAD.PRINT	BRANCH IF NOT TOKEN
1FDC- AA		TAX	X COUNTS THRU KEYWORDS
1FDD- A0 FF		LDY #\$FF	Y COUNTS THRU CHARACTERS
1FDF- C8	LOAD.TOKEN	INY	STEP TO NEXT CHARACTER
1FE0- B9 88 C0		LDA KEY.WORDS-1,Y	LAST CHARACTER IN EACH
1FE3- 10 FA		BPL LOAD.TOKEN	KEYWORD IS MINUS
1FE5- CA		DEX	X GOES MINUS JUST BEFORE
1FE6- 10 F7		BPL LOAD.TOKEN	PROPER KEYWORD IS REACHED
1FE8- C8	LOAD.NCHAR	INY	STEP TO NEXT CHARACTER
1FE9- B9 88 C0		LDA KEY.WORDS-1,Y	
1FEC- 20 76 C9	LOAD.PRINT	JSR BASIC.PRNT	PRINT CHARACTERS UNTIL
1FEF- 10 F7		BPL LOAD.NCHAR	LAST MINUS CHAR IS REACHED
1FF1- 68		PLA	PUT ID CHARACTER OR
1FF2- 88		TAY	TOKEN IN Y
1FF3- 28		PLP	GET CARRY
1FF4- 08		PHP	
1FF5- 90 03		BCC LOAD.SPACE	BRANCH IF GOOD LOAD
1FF7- 20 74 C9		JSR PRINT.?	ELSE, PRINT QUESTION MARK
1FFA- 20 71 C9	LOAD.SPACE	JSR PRINT.SP	PRINT SPACE
1FFD- 28		PLP	RESTORE CARRY
1FFE- 98		TYA	RESTORE Z FLAG
1FFF- 60	LOAD.DONE	RTS	RETURN WITH ID IN A

.EN

Using the BASIC LOAD Command

Step 1: Jump to BASIC and use 7937 in response to MEMORY SIZE? (3841 for 4K).

Step 2: Enter the following direct command:

POKE 202,80: POKE 203,31

or if you have 4K:

POKE 202,80: POKE 203,15.

Now you can use the LOAD command just as before. However, as each file is read its ID is echoed to your terminal followed by a space. If the file has a load error, a question mark is printed immediately after the ID and the search continues until the correct ID is found.

You can abort the tape load process by hitting "CR" on the hex keypad while the search sync character is being displayed. The tape load will also automatically abort if an "END" file is read. Such a file is created by entering NEW and then SAVE END. Normally, the tape ID is the ASCII equivalent of the character entered immediately after a SAVE. However, the BASIC tokens are also allowed as valid tape IDs by entering one of the reserved words listed on page 9 of the BASIC manual. (GET and GO should be added to the list.) Thus you can have a program called GO, LIST, DATA, or even SAVE. For example, type SAVE LIST and LOAD LIST. The key word END is reserved for the last program on the tape.

Using the Program Duplicator

Step 1: Rewind your BASIC program master tape and ready it in your "play" or read-only recorder.

Step 2: Rewind a blank cassette and ready it in your "record" or write-only recorder.

Step 3: From the monitor, enter the following command.

.G 1F7B (or .G F7B for 4K).

This will duplicate all of the BASIC programs from the master tape onto the blank tape. It will even use a long tape delay before the first program to get the tape off its leader and it will quit after the "END" file has been copied.

Step 4: In case an error is detected while loading a program, the program will break to the monitor and display 1F89,0 (or 0F89,0 for 4K). At this point you should put the read-only recorder in rewind and enter a .G command. After the tape has gotten past the file which caused the error, put the read-only recorder back in play mode. You don't need to worry about rewinding too far since the program will only accept the same file ID as the one which originally caused the error. Subsequent tape errors will not cause the program to break again until the specified file has been correctly loaded and duplicated. However, you can cause a break by hitting "CR" on the hex keypad during sync search. After several attempts to load a defective file, remove your master tape cassette and substitute a backup in the read-only recorder until the file is loaded correctly and the write-only recorder turns on. Then re-install the master tape and allow the duplication process to continue.

Step 5: Any time the sync search indication is on, you can cause a break to the monitor by hitting "CR" on the hex keypad. (You may have to turn the read-only recorder off or on to make this work.) A .G command will allow you to continue, but you can also force the program to search for a specific file ID and continue duplicating by entering a .R command followed by three spaces, and changing the value of the accumulator register to the hex equivalent of the desired ID. A value of zero will allow any ID. Finally go back to the program with:

.G 1F89 (or .G F89 for 4K).

Step 6: After duplicating the entire tape, you should verify that the new copy can be loaded correctly. It is safest to keep two backup copies of your master tape which are known to be loadable, so that if for some reason while you are duplicating with any two of your three tapes and a file is impossible to load, you will still have a backup available. If you had only one master and one backup and a file became unloadable while duplicating, there is a good chance that the same file on the backup tape will be overwritten by a previous file during the duplication process, especially if you have updated an earlier portion of the master tape. The procedure I have followed, without losing any programs, is to copy the master tape onto backup number 1, then backup number 1 onto backup number 2, then backup number 2 onto the master, and finally verify the

master by jumping to BASIC and doing a LOAD END, checking that all the IDs are printed without a question mark after them.

Actually, this is an oversimplification. In reality, the original master will consist of more than one tape from which the programs will eventually be combined onto the new master. This duplicating program was specifically designed to allow updating of a master tape primarily through the technique described in *step 5*. Of course, you can still take advantage of the dual cassette control and update a master tape manually through the BASIC interpreter using a sequence of LOAD A, modify, SAVE A, etc.

Explanation of Program Operation

The ASSEMBLY LISTING contains comments which should help in understanding how the program works. However, the following additional comments may also be helpful.

You may want to modify the program slightly for your particular needs. Locations \$1F7F and \$1FB3 contain tape delay values which control the number of sync bytes at the beginning of each tape file and therefore the length of time before each file. The first of these is used only for the first file on the tape and is a large number to allow time for the tape to get past its leader before recording the actual file. With the default High Speed Tape Waveform values this time is 15 seconds. However, if you use speeded-up Waveform values, you will want to use larger tape delay values to get the same time delays. I first learned about the ability to double or triple the cassette baud rate from *SYM-PHYSIS* 3-3 and I now use HSBDRY = \$1A, TAPET1 = \$20 and TAPET2 = \$10 which allows an 8K file to be loaded or saved in about 20 seconds, instead of one minute. I also use \$1E and \$08 for the two tape delay constants in my version of the dual cassette program which I have put into EPROM.

If your SYM-1 system also has the RAE-1 ROMs available, you can use the TAPE.OFF and TAPE.ON routines in them and save 16 bytes of program space. This requires changing the subroutine calls at \$1F45 and \$1F4C. I have piggy-backed the two BASIC ROMs into socket U21 and the two RAE-1 ROMs into socket U22 in order to fit them all onto the SYM-1 at the same time, and still have one socket left for an EPROM. This requires bending pin 20 of the top ROMs and

wiring them directly to their chip select decodes, along with two extra 3.3K pullup resistors.

Two other bytes which you may want to modify are located at \$1F6B and \$1F6D. The first one controls the number of nulls that are inserted by the BASIC print routines after each CR/LF and the second one controls the width of the print line. I have used values that are suitable for a teletype, but if your terminal has fewer characters per line you should put the hex equivalent in the second location. These values are used only by the BASIC Program Duplicator routine.

Don't try to use the Duplicator to copy machine language programs or files other than BASIC programs. The Duplicator assumes that the tape file starts at \$201 which is true for all BASIC programs, and if you try to dup a file that started somewhere else, the program would still use \$201 as the start of the file.

You should also be careful not to read a tape that contains files other than BASIC programs with the LOAD command, even if the file IDs are different from the one specified in the LOAD command. Under the original LOAD, if the ID did not match, the file would not be loaded. But with this new LOAD, every file that is encountered on the tape is loaded before the ID comparison is made.

If you have a special machine language program that vectors through the BASIC zero page jump instruction at \$C9 (decimal 201) and specifies a tape ID of either \$00 or \$FF, then the second cassette control will be activated and the load routine will behave exactly as before.

Once you get a taste for dual cassette control, it's hard to live with only one. It's really worth installing in your SYM!

George Wells has been working on several utility-type software and hardware projects for his SYM such as the one described in this article. His latest project is a hardware design to interface a light pen to Texas Instruments' new TMS9918A high-resolution color video display processor chip. One of these days he thinks he might actually have time to write some programs to put these utilities to good use!

MICRO

DR. DALEY OFFERS SOFTWARE FOR EVERYONE

DATA BASE

The data base package allows total user control over the contents of each entry in the file. Features user selectable record size from 5 to 242 characters per record, statistical and plotting package, output with WORDPRO files or printer. Includes full user definable output formatting. With optional indexing routine can produce a comprehensive index of a data set.

Index **\$299.95**
 99.95
For PET or CBM 4000 or 8000 series
with 32K memory please specify
your machine configuration.

MAIL LIST

\$159.95

For PET or CBM 4000 or 8000 series
with 32K memory please specify
your machine configuration.

This powerful mailing list package features a variety of options for producing labels. It includes user defined file structure and label format. Label format can list to the printer or to WORDPRO format files.

SOFTWARE LIBRARY

Hundreds of schools and individuals have purchased this package for use as an educational tool or just plain fun. It contains 50 (yes fifty!) programs. This ranges from our famous TREK 3 and horse race to fun learning programs for children to checkbook and a micro mail list program with lots in between. At about \$1.40 per program how can you miss?

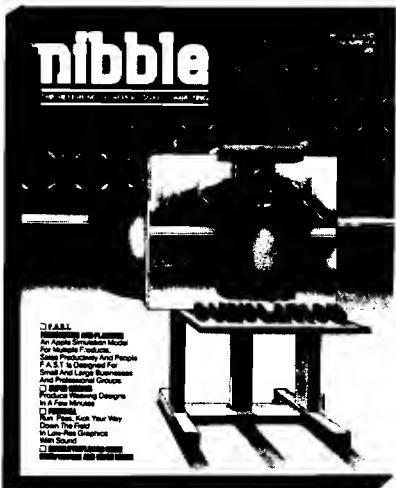
Cassette **\$69.95**
Diskette **79.95**
For APPLE II or PET

Charge to your MC/VISA



DR. DALEY'S SOFTWARE
425 Grove, Berrien Springs, Michigan 49103
Phone (616) 471-5514
Sunday-Thursday noon to 9 p.m. Eastern Time

"NIBBLE® IS TERRIFIC" (For Your Apple)



NIBBLE IS: *The Reference for Apple computing!*

NIBBLE IS: One of the Fastest Growing new Magazines in the Personal Computing Field.

NIBBLE IS: Providing Comprehensive, Useful and Instructive Programs for the Home, Small Business, and Entertainment.

NIBBLE IS: A Reference to Graphics, Games, Systems Programming Tips, Product News and Reviews, Hardware Construction Projects, and a host of other features.

NIBBLE IS: A magazine suitable for both the Beginner and the Advanced Programmer.

Each issue of NIBBLE features significant new Programs of Commercial Quality. Here's what some of our Readers say:

- "Certainly the best magazine on the Apple II"
- "Programs remarkably easy to enter"
- "Stimulating and Informative; So much so that this is the first computer magazine I've subscribed to!"
- "Impressed with the quality and content."
- "NIBBLE IS TERRIFIC!"

In coming issues, look for:

- Numeric Keypad Construction Lab Assembly Language Programming Column
- Pascal Programming Column Data Base Programs for Home and Business
- Personal Investment Analysis Electronic Secretary for Time Management
- The GIZMO Business Simulation Game

And many many more!

NIBBLE is focused completely on the Apple Computer systems.

Buy NIBBLE through your local Apple Dealer or subscribe now with the coupon below.

Try a NIBBLE!

NOTE:
First Class or Air Mail is required for all APO, FPO and all foreign addresses with the following additional amounts.

- USA, Canada, Mexico, APO, FPO \$7.50
- Central and South America \$9.00
- Europe \$12.00
- Asia and elsewhere \$15.00

© 1980 by MICRO-SPARC., INC., Lincoln, Mass. 01773. All rights reserved.
*Apple II is a registered trademark of Apple Computer Company

No. 4

nibble

Box 325, Lincoln, MA. 01773 (617) 259-9710

I'll try nibble!

Enclosed is my \$17.50 (for one year).

check money order

(Please allow 4 to 6 weeks for delivery of 1st issue)

BACK ISSUES of NIBBLE are available for
\$2.00 + .50 postage and handling.

Name _____

Address _____

City _____

State _____ Zip _____

In The Heart Of Applesoft

This article is not written to explain how Applesoft works, but to explain how to work with Applesoft, or more specifically, how and when to use (numerical) Applesoft routines. As an example, a matrix multiplication program is presented. This program runs on the average 5 times faster (depending on the numbers in the matrices) than a comparable BASIC program.

C. Bongers
Erasmus University
Postbus 1738
3000 DR Rotterdam
The Netherlands

My primary motivation to buy a microcomputer was to develop a number of statistical programs which were to be used for a research project I was working on. After comparing several micros with each other, with respect to execution speed of BASIC programs and expansion possibilities, my choice fell on the Apple II. The Apple which I bought was delivered with Applesoft BASIC in ROM. After studying the manuals, I started writing some test programs in order to learn the possibilities and the peculiarities of the machine. Among others, I wrote a program to generate all the permutations of a given sequence of symbols (for instance, ABC has the permutations ABC, ACB, BAC, BCA, CAB, CBA) and a program to solve the 10 by 6 pentomino puzzle (see *BYTE*, Nov. 1979). The permutation program ran reasonably fast (20 permutations per second) but the pentomino program turned out to be a disappointment. After waiting for several hours, it finally produced the first of the 2,339 solutions, so I never bothered trying to find more solutions.

Example 1						
MFP:	Exponent	Mantissa				Sign
Hex contents	\$9D	\$9E	\$9F	\$A0	\$A1	SAC
Decimal	2^{12-13}	$15 \times \frac{1}{16}$	$3 \times \frac{1}{256}$	$11 \times \frac{1}{4096}$	$0 \times \dots$	$12 \times \frac{1}{16^6}$
						$= 1.90380859$

Table 1: Applesoft Routines

I. General remarks

A. Notation

1. $[\rightarrow A, Y]$ means: pointed to by Accumulator [low] and Y register [high].
2. $[A = Z.F. = \$X]$ means: Accumulator has to contain, or contains the contents of location $\$X$. If $\$X$ equals zero, the zero flag (Z.F.) is set or must be set, otherwise the zero flag is or must be clear.

B. Remarks

1. For some routines presented below, the entry and/or exit values of the Accumulator, the X register and the Y register are given. If no entry is specified, no entry is necessary. If no exit or not all registers of an exit are specified, the registers not specified may have unpredictable values after the execution of the Applesoft routine.
2. For each routine, the memory locations that may be modified by the (error free) execution of the routine are given.

C. Warning

1. When working with m.l. programs that are called from BASIC, one may wish to use zero page locations to store temporary results. However, a number of zero page locations are initialized to certain values at the cold/warm start of Applesoft and changing the contents of these locations may lead to unexpected results. Furthermore, there are a number of locations in which Applesoft stores information during the execution of the BASIC program, such as the current line number or the pointer to the line from which data is being read. Clobbering one of these locations usually has the effect that the program will crash sooner or later.

In order to avoid problems when working with zero page addresses it is therefore recommended to consult the zero page usage map in the Applesoft manual first. (See also the memory atlas constructed by Prof. W.F. Luebert, published in the August 1979 issue of *MICRO*.)

(continued)

Table 1: Applesoft Routines (continued)

At that time, however, I discovered that the Apple can also be programmed rather easily in machine language with the help of the mini-assembler. Since I was interested to know what speed gain could be obtained, I translated the permutation program in machine code. To my surprise, the program ran about 675 times faster (approximately 13,500 permutations per second) than the BASIC permutation program. Of course, I immediately got my pentomino program and translated this in machine code too. The 2,339 solutions now came out in less than 3 hours, which meant also a considerable gain in speed as compared to the BASIC program.

When to Use Machine Language Programs or Subroutines

Some programs, like those mentioned above, can easily be translated from BASIC to machine code. However, for the majority of the programs that I intend to write, this is not the case, since in these programs floating point variables rather than "one byte" variables have to be used. For some floating point arithmetic such as addition and multiplication, it is probably possible to write the routines yourself, but for functions such as the sine and the logarithm this would mean a lot of work. Furthermore, being busy with "trying to reinvent the wheel" is not a very stimulating idea.

However, there is a fairly easy way out of this problem. All the routines needed for floating point arithmetic, have to be somewhere in the Applesoft ROM, so all one has to do is list Applesoft and try to understand how it works. After locating the entries of the floating point routines, these routines then can be called by the machine language (m.l.) program. Although the whole process can be written down in a few lines, it took me several weeks of hard work before I knew enough of Applesoft to write, as an exercise, a matrix multiplication subroutine in m.l., which can be called from BASIC by means of the & symbol. This program runs about 8 times faster than a BASIC matrix multiplication subroutine and further has the advantage that the names of the matrices can be passed in an easy way. On the other hand, a disadvantage is that the m.l. program uses more memory space than the BASIC program. At the end of this article, the matrix multiplication program will be more extensively discussed.

Of course, this warning does not apply to (most of the) zero page locations that may be modified by the routines described below. For instance, if one uses neither the power function nor SQR nor trigonometrical functions, it will be safe to use locations \$8A-\$8E, since these locations are used by none of the other functions (routines) listed in this table.

2. If neither strings nor high-resolution graphics nor ON ERR statements are used, one can (probably) safely store temporary results in the following zero page locations:

\$6-\$9, \$17-\$1F, \$58-\$5D, \$71-\$72, \$CE-\$D5, \$D7, \$D9-\$EF, \$F4-\$FF

II. Description and entries of the routines

A. Charget-Charcheck

1. Purpose

The memory locations \$B8 and \$B9 contain—during the execution of a BASIC program—a text pointer which points to the last retrieved character of the BASIC program. The Charget routines can be used to load the next character or the current character (again) in the Accumulator. To determine whether the character equals a predetermined symbol one of the Charcheck routines may be used.

2. Charget routines

\$B1: Advance text pointer and load next character in the Accumulator (spaces are ignored).

Exit(A = next character, X = entry, Y = entry).

Exit Status: Carry is clear if character is a digit (hex value:30-39), otherwise carry is set. Zero flag is set if character equals 0 (= end of line sign) or 3A (= end of statement sign, i.e. ":"), otherwise zero flag is cleared.

Modifies \$B8,\$B9.

\$B7: Load current character another time in the Accumulator.

Exit(A = current character, X = entry, Y = entry).

For status see subroutine \$B1.

3. Charcheck routines

\$E07D: Check whether character in Accumulator is a letter.

Entry(A), Exit(A = entry, X = entry, Y = entry).

Exit Status: Carry is set if character is a letter, otherwise carry is cleared.

The following 4 routines can be used to check whether the text pointer points to a specific symbol. If the result of the check is positive, the next character is loaded in the Accumulator by means of the execution of subroutine \$B1. In the other case, the message "SYNTAX ERROR" is displayed and Applesoft returns to BASIC command level. The exits of the 4 routines are:

Exits(A = next character, X = entry, Y = 0), modify \$B8,\$B9.

\$DEC0: Check whether the character that is pointed to by the text pointer equals the character in the Accumulator.

Entry [A].

\$DEB8: Check whether the text pointer points to a right parenthesis.

\$DEBB: Check whether the text pointer points to a left parenthesis.

\$DEBE: Check whether the text pointer points to a comma.

B. Compare

1. Purpose

The compare routines can be used for comparing a real variable in the MFP with a real variable in the SFP or a real variable in memory.

2. Compare routines

\$DF6A: Compare MFP with SFP according to the status of the comparison in location \$16. The result of the comparison (1 if true, 0 if false) is converted to a real variable in the MFP. The various types of comparisons are listed below.

Type of Comparison	\$16 has to be put equal to:	Result comparison
>	1	1 if SFP > MFP, else 0
=	2	1 if SFP = MFP, else 0
<	4	1 if SFP < MFP, else 0
> =	3	1 if SFP \geq MFP, else 0
< >	5	1 if SFP \neq MFP, else 0
< =	6	1 if SFP \leq MFP, else 0

Modifies \$60,\$61,MFP,SFP.

\$EBB2: Compare MFP with memory ($\rightarrow A, Y$).

Entry(A,Y), Exit(A=FF if MFP < memory, A=0 if MFP = memory, A=1 if MFP > memory), modifies \$60,\$61.

C. Conversion

1. Purpose

The Conversion routines can be used to convert:

- a) a real in the MFP to an integer
- b) a one or two byte integer to a real in the MFP

Unless specified otherwise, all integers are assumed to be two's complement integers.

2. Real to integer conversion routines

\$EBF2: Convert MFP to integer. The number in the MFP must be between -2^{31} and 2^{31} [notation: $-2^{31} < \text{MFP} < 2^{31}$]. Result is stored in mantissa of MFP (locations \$9E-\$A1).

Exit(Y=0), modifies MFP.

\$E752: Convert MFP, where $-2^{16} < \text{MFP} < 2^{16}$, to two byte integer. Store result in \$50 (low) and \$51 (high).

Exit(A=\$51,Y=\$50), modifies \$50,\$51,MFP.

Remark: "Wrap around" occurs if the absolute value of the number in the MFP is larger than $2^{15} - 1$.

\$E10C: Convert MFP, where $-2^{15} < \text{MFP} < 2^{15}$, to two byte integer. Store result in \$A0 (high) and \$A1 (low).

Exit(Y=0), modifies \$60,\$61,MFP.

\$E108: Same as \$E10C, except that entry-value of MFP must be: $0 \leq \text{MFP} < 2^{15}$.

\$DA65: Pack extension byte in MFP and convert MFP, where $-2^{15} < \text{MFP} < 2^{15}$, to two byte integer. Store integer (high byte first) in ($\rightarrow \$85, \86).

Exit(Y=1), modifies \$60,\$61,MFP.

An important point to note is that, as a consequence of using floating point arithmetic, there is a significant drop of the speed gain, namely from a factor 675 obtained with the permutation program to a factor 8 obtained with the matrix multiplication program. The reason is that—when multiplying matrices—a relatively large portion of the CPU time is used for the multiplication and addition of floating point numbers. Whether this is done under control of a BASIC program, or by calling the appropriate routines in Applesoft from a m.l. program, makes no difference, since in both cases the same multiplication and addition routines are used. The gain of speed that occurs in the m.l. matrix multiplication program is obtained by short-cutting the time-consuming determination of the pointers to array elements in BASIC.

It will now also be clear that it does not make any sense to calculate for instance, 1000 logarithms by means of a m.l. program. When written in BASIC, thus

```
10 FOR I = 1 TO 1000 :  
A = LOG (I) : NEXT
```

the program will run approximately 2.3 seconds. About 90% of this time, the computer will be busy with the calculation of the logarithms, and about 10% of the time with the parsing of the statements and the evaluation of the FOR...NEXT loop. When writing a m.l. program to calculate the logarithms, one may expect it to run no more than 10% faster than the BASIC program, since as to the calculation of the logarithms, no time can be saved.

Therefore, with respect to gaining speed, it is only profitable to write a m.l. program or subroutine if, in this way, time-consuming access to array elements can be short-cutted or iterative parts of the program can be made more efficient. Some examples where m.l. routines will be useful are: finding the largest element of an array, calculating the inverse of a matrix, sorting the elements of a vector, or calculating probabilities under a bivariate (log) normal distribution.

Apart from gaining speed, there may however be other arguments for writing m.l. routines. For instance, one may wish to extend tape or disk versions of Applesoft with some self-written BASIC commands or functions. Also, it can be attractive to make frequently used subroutines more independent of

(continued)

PERMANENT RELIEF

Word Processing problems?



Apple PIE

Apple PIE (Programma International Editor) and FORMAT (text formatter) offer full strength solutions to today's word processing problems. These versatile, powerful programs provide document preparation and word processing capabilities previously found only on much larger computer systems.

PIE is a general purpose, full screen editor that uses control keys and function buttons to provide a full range of editing capabilities such as search and replace, delete, copy, insert, move. Changes may be made directly anywhere on the screen and are shown as they are performed.

FORMAT uses simple instructions embedded in the input text to describe the desired appearance of the final document. It handles centering, underlining, indenting, page numbering,



Formatter

margins, headers, footers, even form letters, and includes a proofing capability.

These high-quality, cost-effective programs come with comprehensive documentation and run on a 32K Apple II. They are available through your local computer store or direct from Programma International, Inc. at the introductory price of \$79.95*.

VIDEX VERSION T.M.
DOUBLE VISION T.M.
SUPR TERM VERSION T.M.
STANDARD VERSION

*December 1, \$129.95.

v 11

PROGRAMMA

3400 Wilshire Boulevard
Los Angeles, California 90010

(213) 384-0579



Simple enough for the beginner. Versatile enough for the professional.

Table 1: Applesoft Routines (continued)

3. Integer to real conversion routines

\$E2F2: Convert two byte integer in A (high) and Y (low) to real in MFP.
Entry[A, Y], Exit[Y = 0], modifies MFP, puts \$11 equal to zero.

\$E301: Convert one byte integer in Y to positive real in MFP. (The integer in Y is thus not interpreted as a two's complement integer.)
Entry[Y], Exit[Y = 0], modifies MFP, puts \$11 equal to zero.

\$EB93: Convert one byte integer in Accumulator to real in MFP.
Entry[A], Exit[Y = 0], modifies MFP.

\$DEE9: Pull integer (%) variable from memory ($\rightarrow \$A0, \$A1$) into A (high) and Y (low). Next, convert integer to real in MFP.
Exit[Y = 0], modifies MFP, puts \$11 equal to zero.

D. Copy

1. Purpose

The Copy routines can be used to

- a) pull data (from memory) into the MFP or the SFP
- b) pack the MFP and store the MFP in memory
- c) copy the MFP into the SFP and vice versa
- d) push the MFP on stack or pull the SFP from stack

The Copy routines are for real variables only. For routines that handle integer (%) variables see Conversion.

2. MFP routines

\$EAF9: pull memory ($\rightarrow A, Y$) into the MFP and put the extension byte equal to zero.
Entry[A, Y], Exit[A = Z.F. = \$9D, X = entry, Y = 0], modifies \$5E, \$5F, MFP.

\$EAFD: Pull memory ($\rightarrow \$5E, \$5F$) into the MFP and put the extension byte equal to zero.
Exit[A = Z.F. = \$9D, X = entry, Y = 0], modifies MFP.

\$DE10: Pack extension byte in MFP and push MFP on stack (6 bytes).
Exit[A = Z.F. = \$9D], modifies \$5E, \$5F, MFP.

The following four routines pack the sign and the extension byte in the MFP, store the MFP in the locations indicated and put the extension byte equal to zero.

For all four routines the exits are:

Exits[A = Z.F. = \$9D, Y = 0], modify \$5E, \$5F, MFP.

\$EB1E: store MFP in \$98-\$9C

\$EB21: store MFP in \$93-\$97

\$EB27: store MFP in ($\rightarrow \$85, \86)

\$EB2B: store MFP in ($\rightarrow X, Y$)

3. SFP routines

\$E9E3: Pull memory ($\rightarrow A, Y$) in the SFP and determine \$AB (= the exclusive OR of the signs of the numbers in the MFP and the SFP).
Entry[A, Y], Exit [A = Z.F. = \$9D, X = entry, Y = 0], modifies \$5E, \$5F, SFP, \$AB.

\$E9E7: Pull memory ($\rightarrow \$5E, \$5F$) in the SFP and determine \$AB.
Exit[A = Z.F. = \$9D, X = entry, Y = 0], modifies SFP, \$AB.

(continued)

the main program, so that parameters can be passed by value rather than by name, which in BASIC is only possible by means of a lot of PEEKs and POKEs. Last but not least, one may like the challenge involved in writing m.l. programs.

The Main and Secondary Floating Point Accumulator

Before presenting the Applesoft routines that can be of help when writing m.l. programs, the main and secondary floating point accumulator, (henceforth to be abbreviated as MFP and SFP respectively), will shortly be discussed. Almost all the arithmetical and mathematical routines use the MFP and/or the SFP. The MFP occupies the memory locations \$9D-\$A2 and \$AC. The exponent of the floating point number is in \$9D (in excess 80 code), the mantissa is in \$9E-\$A1, and its sign is in \$A2. Location \$AC is used in most floating point routines as an extra mantissa byte, to increase the precision of the calculations. This location will further be called "the extension byte." An example of how one can convert the contents of the MFP to a decimal number is given in example 1 (page 31). The sign of the number is positive, since the first bit of \$A2 is zero. In case this bit equals one, the sign of the number in the MFP will be negative. The exponent is calculated by converting the hex number 81 in \$9D to decimal, which gives 129, and by subtracting the excess (= 80 (hex) or 128 (decimal)) from it. The method that is used to convert the mantissa to decimal is essentially the same as the method used to convert a normal hex number to decimal, except that instead of the multiplicands 16, 256, 4,096, etc., the reciprocals of these numbers have to be used.

The number zero forms an exception to the rules mentioned above. Applesoft considers a number to be zero if the exponent (\$9D) equals zero, independent of the value of the mantissa.

The results from arithmetical operations and mathematical functions in Applesoft are, in general, placed in the MFP. Next, the MFP is usually normalized and pushed on the stack or stored in memory. The normalizing of the MFP means that the bytes of the mantissa are rotated to the left (zeros enter at the right) until the left-most bit of \$9E equals one. At every rotation the exponent is decreased by one, since rotating the mantissa one bit to the left means multiplying the number in the MFP by two, and this number must, of course, remain the same.

If, after the normalizing process, the MFP has to be stored in memory, it must be packed because the MFP occupies 7 bytes of memory, whereas Applesoft reserves only 5 bytes for the storage of real variables. In the packing routine, first the mantissa is rounded off by considering the left-most bit of the extension byte. If this bit equals one, the mantissa is increased by one, otherwise the mantissa remains the same. Then the sign is packed into the floating point number. If the sign is positive, the left-most bit of \$9E is put equal to zero, otherwise it remains equal to one. Note that the sign can be packed in this way because the first bit of \$9E contains no information since it always equals one after normalizing.

The SFP occupies the memory locations \$A5-\$AA. The exponent is in \$A5, the mantissa in \$A6-\$A9, and its sign in \$AA. The SFP has no extension byte. For the arithmetical and mathematical operations requiring two operands, the first operand has to be put in the MFP and the second operand in the SFP. Thus, loading the SFP and the MFP with two numbers and doing a JSR to, for instance, the multiplication routine, leaves the product of the numbers in the MFP. For some arithmetical routines it is necessary to determine—before the routine is executed—the exclusive OR of the signs of the numbers in the MFP and the SFP. The result must be stored in location \$AB. This implies that the first bit of \$AB must be one if the signs differ, otherwise the first bit has to equal zero. However, in most cases the user does not have to bother about determining the value of \$AB, since it usually is not necessary to load the MFP and/or the SFP "by hand." Applesoft provides us with a lot of routines that can be used to get floating point numbers from memory, unpack them, and place them in the MFP or the SFP. All the routines that pull memory in the SFP also set \$AB to the right value.

The Use of Applesoft Routines

The Applesoft subroutines that are, in my opinion, the most useful for m.l. programmers are listed in table 1. A distinction has been made between various types of subroutines, such as Copy, Errors, Conversion and Mathematical routines, etc. Rather than discussing each of the routines separately, a (very) simple example will be given to illustrate how to work with them. For a good understanding of this example, it is advisable to read the general remarks in table 1 first.

Table 1: Applesoft Routines (continued)

\$DE47: Pull stack in the SFP and determine \$AB. This routine will usually be used in combination with subroutine \$DE10. In that case it is for a successful execution of routine \$DE47 necessary to push the return address of \$DE47 on stack (high order byte first) before executing \$DE10. Contrary to most other routines described here, \$DE47 must be executed by means of a JMP instruction.

Exit(A = Z.F. = \$9D, X = entry, Y = entry), modifies SFP, \$AB.

4. SFP/MFP routines

\$EB53: Copy SFP into MFP, put extension byte equal to zero.

Exit(A = \$9D, X = 0, Y = entry), modifies MFP.

\$EB63: Pack extension byte in MFP and copy MFP into SFP, put extension byte equal to zero.

Exit(A = \$9D, X = 0, Y = entry), modifies MFP, SFP.

\$EB66: Copy MFP (without extension byte) into SFP, put extension byte equal to zero.

Exit(A = \$9D, X = 0, Y = entry), modifies MFP, SFP.

E. Errors

1. Purpose

If an error is detected in a m.l. program, one of the error routines may be used to print an error message.

2. Error messages

To print an error message, load the X register with the code of the message and execute a JMP to \$D412 or execute a JMP to one of the locations listed behind the error messages. After printing the error message, Applesoft returns to BASIC command level (unless an ON ERR statement has been executed).

Code	Error message	JMP location
00	NEXT WITHOUT FOR	\$DD0B
10	SYNTAX ERROR	\$DEC9
16	RETURN WITHOUT GOSUB	\$D979
2A	OUT OF DATA	—
35	ILLEGAL QUANTITY	\$E199
45	OVERFLOW	\$E8D5
4D	OUT OF MEMORY	\$D410
5A	UNDEF'D STATEMENT	\$D97C
6B	BAD SUBSCRIPT	\$E196
78	REDIM'D ARRAY	—
85	DIVISION BY ZERO	\$EAE1
95	ILLEGAL DIRECT	\$E30B
A3	TYPE MISMATCH	\$DD76
B0	STRING TOO LONG	—
BD	FORMULA TOO COMPLEX	\$E430
D2	CAN'T CONTINUE	—
E0	UNDEF'D FUNCTION	\$E30E

F. Expressions

1. Purpose

The Expressions routines can be used to evaluate expressions in an & statement. When calling an expression evaluation routine, the text pointer in \$B8 and \$B9 must point to the first character of the expression. After control is returned from the evaluation routine, the text pointer points to the first character behind the expression. In the evaluation routines below, this character is called the terminal sign. The terminal sign might, for instance, be a comma, but also a special character such as a "#". The locations that are modified by the routines are not specified here, since these depend on the type of the expression.

2. Expression evaluation routines

\$DD67: Evaluate expression to next terminal sign, store result in MFP.

\$E105: Evaluate expression to next terminal sign and convert result, which must be non-negative, to two byte integer in \$A0 (high) and \$A1 (low).
Exit(Y = 0).

\$E6F8: Evaluate expression to next terminal sign and convert result, which must be non-negative, to a one byte integer in \$A1.
Exit(A = terminal sign, X = \$A1, Y = 0).

G. Init

1. Purpose

Initialize mantissa of the MFP or the SFP.

2. Initialization routines

\$EC40: Init mantissa MFP (except extension byte) and Y to value in Accumulator.
Entry(A), Exit(A = entry, X = entry, Y = A), modifies MFP.

\$E84E: Put MFP (\$A2 and \$9D) equal to zero.
Exit(A = Z.F. = 0, X = entry, Y = entry), modifies MFP.

H. Mathematical I (routines with one operand)

\$EBAF: MFP = ABS(MFP)

Exit(A = entry, X = entry, Y = entry), modifies MFP.

\$F09E: MFP = ATN(MFP)

Modifies \$5E, \$5F, \$62-\$66, \$92-\$9C, MFP, \$A3, SFP, \$AB, \$AD, \$AE.

\$SEED0: MFP = - MFP

Exit(X = entry, Y = entry), modifies MFP.

\$EFEA: MFP = COS(MFP)

Modifies \$D, \$16, \$5E, \$5F, \$62-\$66, \$92-\$9C, MFP, \$A3, SFP, \$AB, \$AD, \$AE.

\$EF09: MFP = EXP(MFP)

Modifies \$D, \$5E, \$5F, \$62-\$65, \$92, \$98-\$9C, MFP, \$A3, SFP, \$AB, \$AD, \$AE.

\$EC23: MFP = INT(MFP)

Modifies \$D, MFP.

\$E941: MFP = LOG(MFP)

Modifies \$5E, \$5F, \$62-\$66, \$92-\$9C, MFP, \$A3, SFP, \$AB, \$AD, \$AE.

\$DE98: MFP = NOT(MFP). This routine returns MFP = 1 if MFP = 0, else routine returns MFP = 0.

Modifies MFP, puts \$11 equal to zero.

\$EB90: MFP = SGN(MFP)

Exit(Y = 0), modifies MFP.

\$EB82: Accumulator = SGN(MFP)

Exit(A = FF if MFP < 0, A = 0 if MFP = 0 and A = 1 if MFP > 0, X = entry, Y = entry).

\$EFF1: MFP = SIN(MFP)

Modifies \$D, \$16, \$5E, \$5F, \$62-\$66, \$92-\$9C, MFP, \$A3, SFP, \$AB, \$AD, \$AE.

(continued)

Suppose one wishes to translate a BASIC subroutine to m.l. In that case the m.l. routine can be called from BASIC by means of the & symbol. The & symbol causes an unconditional jump to location \$3F5 where the user can insert a JMP instruction to the start of the m.l. program.

After the execution of the & symbol, the text pointer of BASIC, which is in the locations \$B8 and \$B9, points to the next character of the line (spaces are ignored). Thus, if we have the line

10 & A1, BQ, C

where A1, BQ and C are reals, the text pointer points—after the execution of the & symbol—to the A. Suppose we wish to multiply A1 and BQ and store the result in C. We then first have to determine the starting location of the storage area of the value of A1 in memory. This can be done by making use of the subroutine \$DFE3, listed under the heading Names in table 1. A JSR to \$DFE3 in the m.l. program executes an Applesoft routine which puts the name of the variable (in this case A1) in \$81 and \$82; the status of the variable (in this case real) in \$11 and \$12; the pointer to the location of the variable in \$9B and \$9C; and, most important, the pointer to the value of the variable in \$83 and \$84, as well as in the Accumulator and the Y register.

Now that the starting location of the value of A1 is known, the value of A1 can be pulled into the MFP. For this purpose, the Copy routine \$EAF9 can be used. Since the entry of this routine corresponds with the exit of \$DFE3, the subroutine call to \$EAF9 can be placed directly behind the subroutine call to \$DFE3.

Now that we have stored A1 in the MFP, we can proceed to analyzing line 10. After the execution of subroutine \$DFE3, the text pointer points to the first character behind the name of the variable, which is—in our example—a comma. If one plans to write a serious m.l. program, it might be useful to check whether there is indeed a comma behind the name.

For checking purposes, various routines are listed under the heading Charge-Charcheck. For instance, to check whether a comma is present, a JSR to \$DEBE can be executed. In case the character is not a comma, the "SYNTAX ERROR" message is displayed and Applesoft gives a warm

start on BASIC. If, on the other hand, a comma is present, the text pointer is advanced and points now to the letter B.

To obtain the starting location of the storage area of the value of BQ, again a JSR \$DFE3 is executed. Since A1 and BQ have to be multiplied, BQ must be stored in the SFP. To accomplish this, subroutine \$E9E3 is used, which also can be placed directly behind the JSR \$DFE3 instruction, because the exit of \$DFE3 corresponds with the entry of \$E9E3. Note that it is necessary to fill the MFP before the SFP, because \$AB is set when BQ is pulled in the SFP.

As can be seen, the entry of the multiplication routine \$E982 corresponds with the exit of \$E9E3. So after the JSR to \$E9E3, the multiplication can be carried out by means of a JSR \$E982. Note that the m.l. program can be reduced by several bytes by using JSR \$E97F instead of the last two mentioned subroutine calls.

Finally, the result of the multiplication, which is in the MFP, has to be stored in C. Before this is done, a JSR to \$DEBE is executed to check whether the text pointer points to a comma. Next, the starting location of the storage area of the value of C is determined by means of a JSR \$DFE3 instruction. To store the value of C in memory, the Copy routine \$EB2B can be used. Since the entry of this routine is [X, Y], whereas the exit of \$DFE3 is [A, Y], the instruction TAX must be inserted before the instruction JSR \$EB2B.

After the last execution of \$DFE3, the text pointer points to the end of line 10, so a RTS instruction in the m.l. program returns control to the BASIC program which will restart execution at the line number following line 10. The complete m.l. program is given in example 2 (page 40).

The routine \$DFE3 can also be used to find the start of the storage area of integer (%), variables, elements of arrays, and arrays. If one wishes to use matrix expressions in the & statement, it is necessary to store the hex value 40 in \$14 because otherwise Applesoft will interpret the matrix names in the & statement as names of simple variables. Be sure you don't forget to put \$14 back on zero before returning to BASIC, because otherwise strange things may happen.

Table 1: Applesoft Routines (continued)

\$EE8D: MFP = SQR[MFP]
Modifies \$D,\$5E,\$5F,\$62-\$66,\$8A-\$8E,\$92-\$9C,MFP,\$A3,
SFP,\$AB,\$AD,\$AE.

\$F03A: MFP = TAN[MFP]
Modifies \$D,\$16,\$5E,\$5F,\$62-\$66,\$8A-\$8E,\$92-\$9C,MFP,
\$A3,SFP,\$AB,\$AD,\$AE.

\$EFAE: MFP = RND[MFP]. See Applesoft manual for argument RND function.
Modifies \$5E,\$5F,\$62-\$65,\$92,MFP,SFP,\$C9-\$CD.

I. Mathematical II (routines with two operands)

Add

\$E7C1: MFP = SFP + MFP, \$AB must be determined before subroutine call.
Entry[A = Z.F. = \$9D], modifies \$92,MFP,SFP.

\$E7BE: Pull memory [→ A, Y] in SFP, determine \$AB, add: MFP = SFP + MFP.
Entry[A, Y], modifies \$5E,\$5F,\$92,MFP,SFP,\$AB.

AND

\$DF55: MFP = SFP AND MFP. Routine returns MFP = 1 if MFP and SFP are both unequal to zero, else routine returns MFP = 0.
Modifies MFP, puts \$11 equal to zero.

Divide

\$EA69: MFP = SFP/MFP, \$AB must be determined before subroutine call.
Entry[A = Z.F. = \$9D], modifies \$62-\$66,MFP,SFP.

\$EA66: Pull memory [→ A, Y] in SFP, determine \$AB, divide: MFP = SFP/MFP.
Entry[A, Y], modifies \$5E,\$5F,\$62-\$66,MFP,SFP,\$AB.

Multiply

\$E982: MFP = SFP × MFP, \$AB must be determined before subroutine call.
Entry[A = Z.F. = \$9D], modifies \$62-\$65,MFP.

\$E97F: Pull memory [→ A, Y] in SFP, determine \$AB, multiply: MFP = SFP × MFP.
Entry[A, Y], modifies \$5E,\$5F,\$62-\$65,MFP,SFP,\$AB.

\$E2B6: Multiply two byte integer in \$AD (low) and \$AE (high) with two byte integer in \$64 (low) and Accumulator (high). Store product in X register (low) and Y register (high).
Entry[A], Exit[X = low byte product, Y = high byte product], modifies \$65,\$AD,\$AE, puts \$99 equal to zero.

Or

\$DF4F: MFP = SFP OR MFP. Routine returns MFP = 0 if MFP = SFP = 0, else routine returns MFP = 1.
Modifies MFP, puts \$11 equal to zero.

Power

\$EE97: MFP = SFP^{MFP}.
Entry[A = Z.F. = \$9D], modifies \$D,\$5E,\$5F,\$60-\$66,\$8A-\$8E,\$92-\$9C,MFP,\$A3,SFP,\$AB,\$AE,\$AD.

Subtract

\$E7AA: Determine \$AB, subtract: MFP = SFP - MFP.

Modifies \$92, MFP, SFP, \$AB.

\$E7A7: Pull memory ($\rightarrow A, Y$) in SFP, determine \$AB, subtract: MFP = SFP - MFP.

Entry[A, Y], modifies \$5E, \$5F, \$92, MFP, SFP, \$AB.

J. Names

1. Purpose

The Names routine can be used—during the evaluation of the & statement—to find the name, the status and the starting location of the storage area of simple variables, array elements and arrays.

2. Name routine

\$DFE3: At the start of the execution of \$DFE3, the text pointer must point to the first character of the name. After the execution of \$DFE3, the text pointer points to the first character behind the name and the name and status locations are filled according to the table below.

Name variable or array (el.)		Status variable or array (el.)	
\$81	\$82	\$11	\$12
Real	pos	pos	0
String (\$)	pos	neg	FF
Integer (%)	neg	neg	0
			80

For example, if a variable has the name AB, \$81 and \$82 will contain the hex values 41 and 42 respectively, whereas if a variable has the name AB%, \$81 and \$82 will be loaded with the hex values C1 and C2. In the latter case, \$12 is put equal to the hex value 80, to indicate that the variable is integer valued.

Furthermore, Applesoft loads the pointer to the start of the storage area of the variable or the array in \$9B (low) and \$9C (high). The pointer to the start of the storage area of the value of the variable or the array element is loaded in A = \$83 (low) and Y = \$84 (high). If an array element is evaluated, the pointer to the first element of the array is stored in \$94 (low) and \$95 (high).

In case one wishes to use matrix expressions in the & statement (for instance & A = A - B, where A and B are matrices), the hex value 40 must be stored in \$14 before executing \$DFE3. Before returning to BASIC, \$14 has to be reset to zero again.

Under the assumption that no strings are used in the BASIC program (which may lead to house cleaning activities), the following locations may be modified by the execution of \$DFE3.

1. At the evaluation of simple variable names: \$10, \$11, \$12, \$81-\$84, \$94-\$97, \$9B, \$9C, \$B8, \$B9.
2. At the evaluation of array elements: \$F, \$10-\$12, \$81-\$84, \$94-\$97, \$9B, \$9C, MFP, \$AE, \$AD, \$B8, \$B9. In addition, other locations may be modified, depending on the expressions in the subscripts.
3. At the evaluation of [already dimensioned] array names which have to be interpreted as matrix names: \$10, \$11, \$12, \$81, \$82, \$9B, \$9C, \$B8, \$B9.

(continued)

Apart from using names in the & statement, one can also insert expressions. For instance, & SIN[1] + SQR[B]. To evaluate such an expression, subroutine \$DD67 can be executed in the m.l. program. The result of the expression is stored in the MFP. If the result has to be converted to an integer value, a JSR \$E105 or a JSR \$E6F8 instruction can be used instead of the JSR \$DD67 instruction.

It might be possible that a wrong input to the m.l. program, or an error during the execution of the m.l. program, is detected. This will, for example, be the case if a matrix that is to be inverted turns out to be not a square matrix. In that case, one may want to let Applesoft print an error message—indicating the kind of the error—with the line number of the & statement that caused the error. For this purpose, the routines listed under the heading Errors may be used. In the case of the wrongly dimensioned matrix, a JMP \$E196 instruction, for instance, displays the message "BAD SUBSCRIPT IN XX." After displaying the message Applesoft returns to BASIC command level.

Although there are more routines in table 1, it seems superfluous to discuss them here, since it will now be obvious how to use them. Instead, an example will be given to show how to integrate some of the routines in a matrix multiplication program.

A Matrix Multiplication Program

When written in BASIC, a matrix multiplication subroutine consists of the statements

```
499 REM MATRIX MULTIPLICATION : C(R,P) = A(R,S) X B(S,P)
500 FOR I = 1 TO P
510 FOR J = 1 TO R
520 LET D = 0
530 FOR K = 1 TO S
540 LET D = D + A(J,K) X B(K,I)
550 NEXT K
560 LET C(J,I) = D
570 NEXT J
580 NEXT I
590 RETURN
```

To execute this subroutine, the following main program can be used:

```

10 INPUT "DIMENSIONS
      MATRICES P,R,S ? ";P,R,S
20 DIM A(R,S),B(S,P),C(R,P)
30 FOR I = 1 TO R
40 FOR J = 1 TO S
50 LET A(I,J) = I + J
60 NEXT J
70 NEXT I
80 FOR I = 1 TO S
90 FOR J = 1 TO P
100 LET B(I,J) = I * J
110 NEXT J
120 NEXT I
130 GOSUB 500
140 STOP

```

In the main program, the matrices A and B are dimensioned and initialized. Next, the matrix multiplication subroutine is called to put C equal to the product of A and B. If a m.l. program is written to multiply two matrices, the subroutine call at line 130 can be replaced by

130 & C = A × B

Although the matrix names in the & statement can be chosen freely, we will use in the sequel the names C, A and B to denote the respective matrices. The dimensions of the matrices will be denoted by the same letters as in the BASIC program (i.e. P, R and S).

The m.l. program can be split up into a main program and several subroutines. The main program performs the evaluation of the & statement. The first subroutine, called FNAME, takes care of the calculation of the pointers to the storage areas of the matrices C, A, and B in memory. The second subroutine, called MATMULT, is used for the actual matrix multiplication. Two other subroutines, ADD and ADD5, are called by FNAME and MATMULT to do some frequently occurring additions. A discussion of the functions of the various routines—which are listed in table 2—follows.

1) The main program (\$4000-\$4022)

The main program is written solely to control the multiplication of two matrices. Therefore it has to be replaced by another main program if the number of matrix operations is extended (with, for instance, add, subtract and inverse). The comment inserted in the listing shows how the program works.

Table 1: Applesoft Routines (continued)

K. Normalize

\$E82E: Normalize MFP

Exit[Y = 0], modifies MFP.

L. Pack

\$EB72: Pack extension byte in MFP.

Exit[X = entry, Y = entry], modifies MFP.

Example 2

\$3F5 : JMP \$5000	Jump to multiplication program
\$5000 : JSR \$DFE3	Find starting location of value of first variable
\$5003 : JSR \$EAF9	Pull first variable into the MFP
\$5006 : JSR \$DEBE	Check on comma in & statement
\$5009 : JSR \$DFE3	Find starting location of value of second variable
\$500C : JSR \$E9E3	Pull second variable in the SFP, and
\$500F : JSR \$E982	Multiply MFP with SFP, store product in MFP
\$5012 : JSR \$DEBE	Check on comma
\$5015 : JSR \$DFE3	Find starting location of value of third variable
\$5018 : TAX	Prepare entry store routine
\$5019 : JSR \$EB2B	Store product in third variable
\$501C : RTS	Return to BASIC

Table 2: Listings of Machine Language Programs

A. The main program

Purpose

The evaluation of the & statement: & C = A × B, where C, A and B are matrices.

Listing

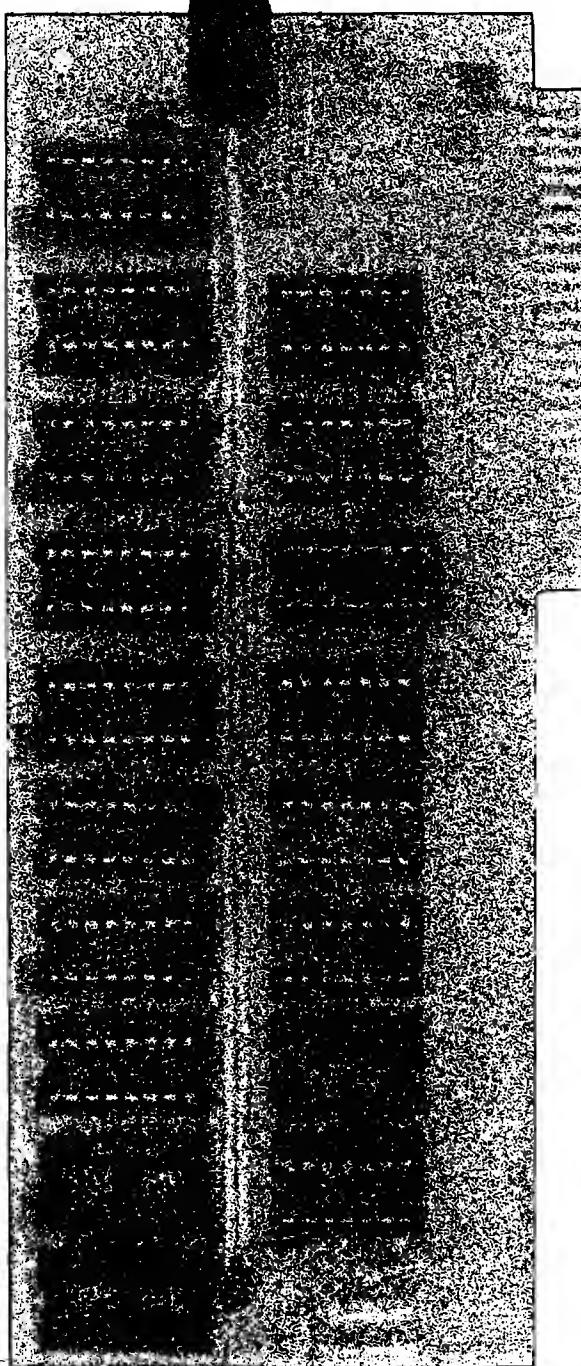
\$3F5 : JMP \$4000	Init jump location for & statement.
\$4000 : LDX #\$F8	Init location \$08 for FNAME.
\$4002 : STX \$08	
\$4004 : JSR \$4025	Execute FNAME on first matrix [C].
\$4007 : LDA #\$D0	Check on "=" in & statement.
\$4009 : JSR \$DEC0	
\$400C : JSR \$4025	Execute FNAME on second matrix [A].
\$400F : LDA #\$CA	
\$4011 : JSR \$DEC0	Check on "×" in & statement.
\$4014 : JSR \$4025	Execute FNAME on third matrix [B].
\$4017 : LDA \$06	
\$4019 : STA \$71	Restore column length of A (=column length of C) in \$71 and \$72.
\$401B : LDA \$07	
\$401D : STA \$72	
\$401F : JSR \$40A5	Execute MATMULT.
\$4022 : RTS	Return to BASIC.

B. Subroutine FNAME

Purpose

Find name of array, check whether array has two dimensions, each less than 256. Store dimensions in \$FC,X (second dimension) and \$FD,X (first dimension). Calculate column length of array (in bytes) and store it in \$71 (low) and \$72 (high). Calculate pointer to storage area of first element of second column of array, and store pointer in \$0,X+2 and \$1,X+2. FNAME can be called successively three times (or less). Before the first call, the hex value F8 must be stored in location \$08. At the start of FNAME, the X register is loaded with the value in location \$08. During the execution of FNAME the X register is incremented by two and stored in location \$08 so that the contents of location \$08 are incremented by two each time FNAME is called.

(continued)



16K RAM Expansion Board for the Apple II*

\$195.00

- expands your 48K Apple to 64K of programmable memory
- works with Microsoft Z-80 card, Visicalc, LISA ver 2.0 and other software
- eliminates the need for an Applesoft* or Integer Basic ROM Card
- switch selection of RAM or mother board ROM language
- includes installation and use manual
- fully assembled and tested



Visa and MasterCard accepted



Shipping and handling will be added unless the order is accompanied by a check or money order
N.C. residents add 4% sales tax

*Apple II and Applesoft are trademarks of Apple Computer, Inc.

ANDROMEDA



INCORPORATED**

P.O. Box 19144
Greensboro, NC 27410
(919) 852-1482

**Formerly Andromeda Computer Systems

2) Subroutine FNAME (\$4025-\$4083)

Contrary to the main program, FNAME is constructed in such a way that it can be used for other matrix operations too. The main purpose of FNAME is to calculate the pointer to the first element of the second column of the array being evaluated. The second column is taken because it is customary to use—when working with matrices—non-zero values of the subscripts only, whereas Applesoft reserves—when it encounters a DIM X(P,R) statement—P+1 rows and R+1 columns for the array because it allows zero subscripts. As an example, suppose that a DIM X(2,3) instruction is executed in a BASIC program. Applesoft stores the X-array column-wise (example 3, page 46).

When multiplying the X matrix with another matrix, only the underscored elements have to be taken into account. Since the first column contains no underscored elements, it can be skipped.

Subroutine FNAME can be called successively (at most) three times. At the first call, location \$08 must contain the hex value F8, being the start of the storage area, plus 4 of the matrix information. Consulting the memory map of FNAME in table 2, it can be seen that the dimensions of the C array, P+1 and R+1, are stored in \$F4 and \$F5 and the pointer to the first element of the second column of the C array (i.e., the pointer to C(0,1) in \$FA and \$FB. Since location \$08 is automatically incremented by 2, each time FNAME is called, the dimensions of the next array (i.e., the A array) will—at the second call of FNAME—be stored in \$F6 and \$F7 and the pointer in \$FC and \$FD. The information of the B array is stored in \$F8, \$F9, \$FE and \$FF.

Apart from the calculation of the pointer, FNAME also checks whether the array being evaluated has two dimensions, and whether the size of each dimension is less than 256. The latter check is necessary because MATMULT can handle matrices with dimensions less than 255 only, which will be sufficient for almost all practical purposes.

Finally, at each call of FNAME, the column length of the array being evaluated (which equals 5 times the number of column elements, since reals use 5 bytes of memory) is calculated and stored in \$71 and \$72.

Table 2: Listings of Machine Language Programs (continued)

Memory Map of FNAME

\$06	Column length (in bytes) of first array (C).
\$07	Pointer to storage area of array information.
\$71	Column length (in bytes) of third array (B).
\$72	
\$F4	Second dimension of first array (C).
\$F5	First dimension of first array (C).
\$F6	Idem for second array (A).
\$F7	
\$F8	Idem for third array (B)
\$F9	
\$FA	Pointer to first element of second column of first array (C).
\$FB	
\$FC	Idem for second array (A).
\$FD	
\$FE	Idem for third array (B).
\$FF	

Listing FNAME Comment

\$4025 : LDA #\$40	Put \$14 equal to 40 for search of matrix name.
\$4027 : STA \$14	
\$4029 : JSR \$DFE3	Determine pointer to start storage area of array.
\$402C : LDX \$08	X is loaded with pointer to storage area array information.
\$402E : LDA \$12	
\$4030 : ORA \$11	
\$4032 : BEQ \$4037	Check whether array contains reals.
\$4034 : JMP \$DD76	If not, display "TYPE MISMATCH".
\$4037 : STA \$14	Put \$14 back on zero.
\$4039 : LDY #04	
\$403B : LDA #\$02	
\$403D : CMP (\$9B),Y	Compare number of dimensions of array with 2.
\$403F : BEQ \$4044	
\$4041 : JMP \$E196	If not equal, display "BAD SUBSCRIPT".
\$4044 : INY	
\$4045 : LDA(\$9B),Y	
\$4047 : BNE \$4041	Check whether dimensions of array are both less than 256. If not, display "BAD SUBSCRIPT".
\$4049 : INY	If yes, store second dimension in \$FC,X and first dimension in \$FD,X.
\$404A : LDA(\$9B),Y	
\$404C : STA \$FC,X	
\$404E : INX	
\$404F : INY	
\$4050 : CPY #09	
\$4052 : BNE \$4045	
\$4054 : TYA	Accumulator contains 9 here.
\$4055 : CLC	
\$4056 : ADC \$9B	To obtain the pointer to the storage area of the first element in the array, 9 is added to the pointer in \$9B and \$9C. The result is stored in \$00,X (low) and \$01,X (high).
\$4058 : STA \$00,X	
\$405A : LDA \$9C	
\$405C : ADC #\$00	
\$405E : STA \$01,X	
\$4060 : LDA \$FB,X	
\$4062 : LDY #00	
\$4064 : STY \$72	
\$4066 : ASL	
\$4067 : ROL \$72	
\$4069 : ASL	
\$406A : ROL \$72	
\$406C : ADC \$FB,X	
\$406E : STA \$71	
\$4070 : BCC \$4074	
\$4072 : INC \$72	Calculate the column length of the array by multiplying the size of the first dimension (which was stored in \$FB,X) with 5. The column length is stored in \$71 and \$72.

\$4074 : CPX #\$FA	Is it the first call of FNAME?
\$4076 : BNE \$407E	
\$4078 : STA \$06	If yes, save column length of the array in \$06 and
\$407A : LDY \$72	\$07.
\$407C : STY \$07	
\$407E : JSR \$4087	Add column length to the last calculated pointer
\$4081 : STX \$08	to obtain the pointer to the storage area of the
\$4083 : RTS	first element of the second column of the array.
	Store X in \$08 for next calls of FNAME and
	return to main program.

C. Subroutines ADD and ADD5

Purpose ADD

Add two byte integer in \$71 (low) and \$72 (high) to two byte integer in \$00,X (low) and \$01,X (high). Store result in \$00,X (low) and \$01,X (high).

Entry(X), Exit(A = \$01,X, X = entry, Y = entry).

Purpose ADD5

ADD 5 to two byte integer in \$00,X (low) and \$01,X (high). Store result in \$00,X (low) and \$01,X (high).

Entry(X), Exit(A = \$00,X, X = entry, Y = entry).

Listing ADD

\$4085 : LDA \$71	\$4095 : CLC
\$4087 : CLC	\$4096 : LDA \$00,X
\$4088 : ADC \$00,X	\$4098 : ADC #05
\$408A : STA \$00,X	\$409A : STA \$00,X
\$408C : LDA \$72	\$409C : BCC \$40A0
\$408E : ADC \$01,X	\$409E : INC \$01,X
\$4090 : STA \$01,X	\$40A0 : RTS
\$4092 : RTS	

Listing ADD5

\$4095 : CLC
\$4096 : LDA \$00,X
\$4098 : ADC #05
\$409A : STA \$00,X
\$409C : BCC \$40A0
\$409E : INC \$01,X
\$40A0 : RTS

D. Subroutine MATMULT

Purpose

Multiply matrix A(R,S) (dimensions in \$F6 (S+1) and \$F7 (r+1), pointer in \$FC and \$FD)

with matrix B(S,P) (dimensions in \$F8 (P+1) and \$F9 (S+1), pointer in \$FE and \$FF)

and store result in matrix C(R,P) (dimensions in \$F4 (P+1) and \$F5 (R+1), pointer in \$FA and \$FB)

where P, R, and S each have to be less than 255.

Memory map of MATMULT

\$06	cr : Row counter for C.
\$07	cs : Multiplication counter for row/column multiplication.
\$17	hp _A : pointer to first element of current row of A.
\$18	
\$19	p _B : pointer to first element of current column of B.
\$1A	
\$71	k = 5(R+1) : Column length of A (in memory).
\$72	
\$F4	P + 1 at entry. Used as column counter for C.
\$F5	R + 1 = number of elements per column of C (in memory)
\$F6	S + 1 : S equals the number of multiplications necessary to multiply a row of A with a column of B.
\$F8	pc _A : pointer to current element of A.
\$F9	
\$FA	pc _C : pointer to current element of C.
\$FB	
\$FC	pa : pointer to first element of second column of A.
\$FD	
\$FE	pc _B : pointer to current element of B.
\$FF	

The column length of the C array, which equals the column length of the A array, is saved in locations \$06 and \$07, because the latter column length is needed later for MATMULT.

3) Subroutine MATMULT (\$40A5-\$4124)

Before the matrices are multiplied, the dimensions are checked to determine whether they satisfy the conditions for multiplication. Next, the multiplication is carried out as indicated by the flow diagram in figure 1. The flow diagram shows that the pth column of C (p = 2,..P+1) is obtained by multiplying the R rows of A (i.e., row 2,...R+1) each with the pth column of B (p = 2,..P+1). Note that at a row/column multiplication, the product of the first element of a row and the first element of a column is omitted since these elements have zero subscripts. The elements of the rows of A are separated by a distance of k (= 5(R+1)) bytes from each other in memory, so that each time a next row element of A is needed, k has to be added to pc_A. After a row of A, not being the last row, has been multiplied with a column of B, the hp_A pointer is incremented by 5 and pc_A is put equal to hp_A, so that pc_A now points to the second element of the next row of A. If a column of C, not being the last column, has been filled, hp_A is put equal to its starting value. That is, pa, and pb is put equal to pc_B, which at that time points to the first element of the next column of B.

The flow diagram further shows how the multiplication of a row with a column is performed. The stack is used to store the sum of the products obtained so far, and each time a row element is multiplied with a column element, the stack is pulled into the SFP and the newly-obtained product is added to it. The result is then pushed on the stack again. This process is continued until the row/column multiplication is ready. The row/column product is then stored in memory.

Note that the subroutine address pushed on the stack at locations \$40CE-\$40D3 is the address minus one of the instruction following the JMP instruction at location \$40E5. If the MATMULT subroutine is relocated to another part of memory, this subroutine address must be adjusted.

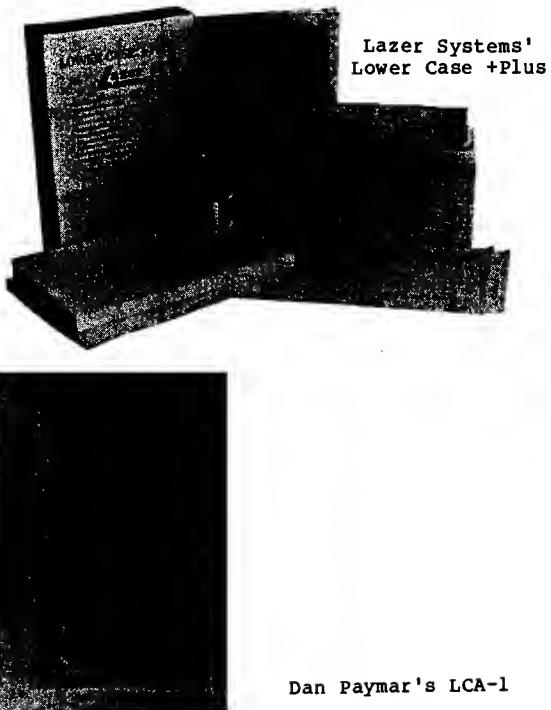
(continued)

LOWER CASE +PLUS

for the Apple II Computer

By **Lazer**
SYSTEMS

Guess which Apple (tm) compatible
lower case adapter costs less:



(You would probably pick the one on the bottom because you can see that you get well over twice as much in the package on top.)

WRONG!! Both the Lazer Systems' Lower Case +Plus (tm) (on the top) and the Dan Paymar LCA-1 (tm) (on the bottom) cost \$59.95 (Paymar lowered the price of his Lower Case adapter from \$64.95 shortly after the release of the Lower Case +Plus). Even if the Lower Case +Plus was priced at \$79.95, it would still be a better buy.

The Lower Case +Plus uses a high quality double sided printed circuit board with solder mask and silkscreen. The Paymar LCA-1 uses a low-cost single sided board. The Lower Case +Plus uses a 2716-compatible ROM for its character generator. You can readily create your own character sets using a HI-RES character generator, such as the "Keyboard Filter", sold with the ROMPLUS from Mountain Computer. The LCA-1 uses a fixed, non-modifiable character set. The Lower Case +Plus comes with two character sets, while the LCA-1 has only one. The Lower Case +Plus supports 128 displayable characters, while the LCA-1 supports only 96.

Word Processor Compatibility

The Dan Paymar LCA-1 made word processing on the Apple II practical; Lazer Systems made it even better. The Lazer Systems Lower Case +Plus is compatible with all word processing programs which can utilize the Paymar LCA-1 for lower case display.

One Board Works with all Apples

Apple Computer recently changed the design of their character generator logic rendering the LCA-1 useless in the newer Apple II's. So, Dan Paymar created the LCA-2 which works only with the newer Apples. There's only one problem, you have to know which Apple you own before ordering. This problem is nonexistent with the Lazer Systems' Lower Case +Plus because our board works with both the older and newer Apples.

A Complete Package

For \$59.95 Dan Paymar will sell you an LCA-1 (\$49.95 for the LCA-2 EPROM), some descriptive literature and a plastic bag. (see the photo)

For \$59.95 Lazer Systems provides you with the Lower Case +Plus, Basic software on disk and over 40 pages of user documentation all neatly packaged (see photo for entire contents*). Pascal and Applewriter patches are provided with our documentation. Pascal users may elect to purchase Pascal software on diskette for \$9.95. Both the Basic and Pascal software packages give you the capability of entering all 96 printable characters into your programs.

The Expansion Socket (Our Exclusive)

No one else has it. Not Paymar, Videx, Data shifter (Muse) nor Uni-Text. The expansion socket on the Lazer Systems' Lower Case +Plus gives you capabilities found only on the Apple III. By adding our Graphics +Plus (tm) your Apple can software select either of the two character sets on the Lower Case +Plus or a third, RAM-based, character set on the Graphics +Plus. With a RAM-based character set, you can program high resolution graphics animation which will run up to ten times faster than equivalent programs using the Apple's HI-RES graphics and requires only one eighth the memory.

The other addition to our expanding line is the Lazer Systems' Keyboard +Plus (tm). This device allows you to enter upper and lower case using the shift key on your Apple keyboard. Imagine what this feature will do for word processing applications. The Keyboard +Plus also incorporates a FIFO buffer which allows you to continue typing even though the computer is busy. Have you ever lost characters because the Apple only retains the last character typed? With a Keyboard +Plus installed you won't have to wait for your computer.

The Keyboard +Plus and Graphics +Plus will be premiered and available at the West Coast Computer Fair in San Francisco.

A Special Offer to Lessen the Sting

If you are considering the purchase of a Lower Case adapter, we're sure you will feel the Lazer Systems' Lower Case +Plus is your best buy. If you already own a Dan Paymar LCA, you may want to switch to the Lower Case +Plus. So, for those of you who already own a Dan Paymar LCA-1, we will grant you an \$18.00 trade-in allowance towards the purchase of a Lower Case +Plus. Sorry, for the LCA-2, owners we can offer only \$10.00 since it is nothing more than a 2716 EPROM with useless data that will have to be cleaned before the EPROM can be used again. This offer expires April 30, 1981.

ORDER FROM: **Lazer**
SYSTEMS P.O. Box 55518
Riverside, Calif. 92517
(714) 682-5268

We gladly accept Mastercard and Visa. Include card#, expiration date and signature.

Lower Case +Plus. \$59.95
Pascal Software \$9.95

Add \$2.00 shipping & handling to all orders.
Calif. residents add 6% sales tax.

Outside U.S.A. requires additional charges:

Canada & Mexico add \$7.00

All other countries add \$15.00.

Foreign orders must be pre-paid by Mastercard, Visa or certified check in U.S. dollars.

The information presented in this ad was accurate at the time of writing, December 26, 1980.

*Three ICs shown plugged in comes from your computer.

Dealer inquiries invited.

Table 2: Listings of Machine Language Programs (continued)

Listing MATMULT	Comment
\$40A5 : LDA \$F4	
\$40A7 : CMP \$F8	
\$40A9 : BEQ \$40AE	
\$40AB : JMP \$E196	
\$40AE : LDA \$F5	Check dimensions for multiplication. If an error is detected, display "BAD SUBSCRIPT".
\$40B0 : CMP \$F7	
\$40B2 : BNE \$40AB	
\$40B4 : LDA \$F6	
\$40B6 : CMP \$F9	
\$40B8 : BNE \$40AB	
\$40BA : DEC \$F4	
\$40BC : BNE \$40BF	
\$40BE : RTS	
\$40BF : LDA \$F5	
\$40C1 : STA \$06	
\$40C3 : LDX #\$03	
\$40C5 : LDA \$FC,X	
\$40C7 : STA \$17,X	
\$40C9 : DEX	
\$40CA : BPL \$40C5	
\$40CC : BMI \$4100	
\$40CE : LDA #\$40	
\$40D0 : PHA	
\$40D1 : LDA #\$E7	
\$40D3 : PHA	
\$40D4 : JSR \$DE10	
\$40D7 : LDA \$F8	
\$40D9 : LDY \$F9	
\$40DB : JSR \$EAF9	
\$40DE : LDA \$FE	
\$40E0 : LDY \$FF	
\$40E2 : JSR \$E97F	
\$40E5 : JMP \$DE47	
\$40E8 : JSR \$E7C1	
\$40EB : LDX #\$F8	
\$40ED : JSR \$4085	
\$40F0 : LDX #\$FE	
\$40F2 : JSR \$4095	
\$40F5 : DEC \$07	
\$40F7 : BNE \$40CE	
\$40F9 : LDX \$FA	
\$40FB : LDY \$FB	
\$40FD : JSR \$EB2B	
\$4100 : LDX #\$FA	
\$4102 : JSR \$4095	
\$4105 : DEC \$06	
\$4107 : BEQ \$40BA	
\$4109 : LDX #\$17	
\$410B : JSR \$4095	
\$410E : STA \$F8	
\$4110 : LDA \$18	
\$4112 : STA \$F9	
\$4114 : LDA \$19	
\$4116 : STA \$FE	
\$4118 : LDA \$1A	
\$411A : STA \$FF	
\$411C : LDA \$F6	
\$411E : STA \$07	
\$4120 : JSR \$E84E	
\$4123 : BEQ \$40F0	
	Check dimensions for multiplication. If an error is detected, display "BAD SUBSCRIPT".
	$P = P - 1$: decrement column counter for C. If P equals zero, matrix multiplication is ready
	Return to main program.
	$cr = R + 1$: init row counter for C.
	$hp_A = p_A$
	$p_B = cp_B$
	Always taken.
	Push subroutine address for routine \$DE47 on stack.
	Push MFP on stack.
	Load (pc_A) in MFP.
	Load (pc_B) in SFP and Multiply MFP with SFP. Store product in MFP.
	Pull stack into SFP.
	Add MFP and SFP. Store sum in MFP.
	$pc_A = pc_A + k$
	$pc_B = pc_B + 5$
	$cs = cs - 1$
	If cs equals zero, row/column product is ready.
	Store MFP in (pc_C) .
	$pc_C = pc_C + 5$
	$cr = cr - 1$
	Is column of C filled? If yes, init hp_A , p_B and cr .
	$hp_A = hp_A + 5$
	$pc_A = hp_A$
	$pc_B = p_B$: restore column counter for B.
	$cs = S + 1$: init multiplication counter.
	Initialize MFP to zero.
	Always taken.

Some Final Remarks

Probably not all Apple owners will have Applesoft in ROM. However, since the disk and tape versions of Applesoft which I have seen do not differ by more than a few bytes from the ROM version, it will be no big problem to convert the entries of the routines listed in table 1 to these versions. The easiest way to do this is to find someone who has Applesoft in ROM, so that the differences can readily be traced back by comparing the versions with each other. In case no ROM version is available, one can use the subroutine entry locations, which are found at the beginning of the Applesoft program. The sequence of the first 64 subroutine entry locations* corresponds with the listing of the tokens in the Applesoft manual (#A2L0006 on page 121). Next, the entry locations of the routines for SIGN to MID\$ follow. The rest of the entry locations* are for +, -, \times , $/$, O, AND, OR, unary minus, NOT and comparison. Before each of the latter entries, a code, indicating the order of the operation, is inserted.

Looking at table 3, where the entries of the routines for the ROM version are listed alphabetically, with the entries found in tape or disk versions of Applesoft, it will become apparent what differences there are. After that, the entry locations of the routines in table 1 can be converted accordingly.

As a last point I wish to express my admiration for the ingenuity of the writers of Applesoft. During my study of Applesoft, I often searched for hours for what was happening, in a seemingly endless sequence of (recursive) subroutines, which taught me a lot about m.l. programming. Apart from a few errors that were made (for instance, a zero byte forgotten between \$E101 and \$E102, so that the program

10 A% = -32768.00049 :
PRINT A%

gives a surprising result) I came to the conclusion that Applesoft is a very good interpreter.

I also wish to express my gratitude to Mr. F. Curvers of the Erasmus University in Rotterdam, for providing me with an excellent cross reference of Applesoft, without which my work would have been far more difficult.

*Add one to the location found in the listing because the subroutines are executed via the RTS instruction.

Cornelis Bongers is an assistant professor of statistics at the Erasmus University in Rotterdam. He uses his Apple II for solving statistical problems (for instance, likelihood maximization). Another important field of application is finding the solution of standardization problems,

which in essence means: finding the set of sizes that minimizes the overall costs caused by the standardization of a product. As a hobby, he develops utility programs for the Apple, such as an assembler cross reference program and a disk-to-tape dump utility.

WANTED! Good Articles and Good Photos MICRO Pays Very Well!

As we increase in size—this issue has 96 pages, 16 more than formerly—we can include more articles. However, we are becoming more selective about the articles we accept.

MICRO is committed to covering all of the 6502 systems. To do this well, we need a variety of articles on each system. We can always use more high-quality articles relating to AIM, SYM, KIM, Apple, Atari, PET/CBM, and Ohio Scientific systems. We are especially interested in good articles which apply to 6502 systems in general.

Because we plan to use more illustrations than formerly, we encourage authors to "think pictorially" and to send us good line drawings and black and white photos.

We are also looking for black and white photos which might stand alone, with a brief caption. Photos of 6502 systems in unusual business or professional environments would be especially welcome. Photos used independently of articles will be paid for separately.

For details on how to submit manuscripts for possible publication, ask for *MICRO Writer's Guide*. Write or telephone:

Editorial Department
MICRO
P.O. Box 6502
Chelmsford, MA 01824
617/256-5515

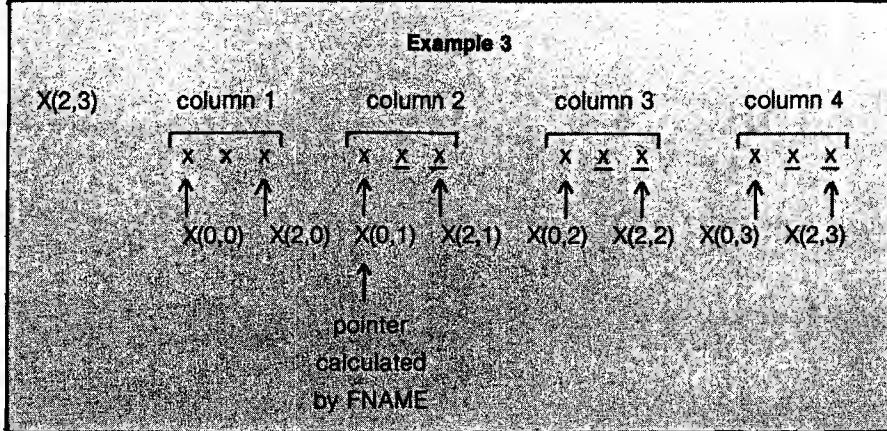


Table 3: Applesoft (ROM) Entry Locations

Entry	Dec token	Key-word	Entry	Dec token	Key-word	Entry	Dec token	Key-word
\$3F5	175	&	\$F3D8	144	HGR2	\$F3BC	167	RECALL
\$E982	202	×	\$F286	163	HIMEM:	\$D9DC	178	REM
\$E7C1	200	+	\$F232	142	HLIN	\$D849	174	RESTORE
\$E7AA	201	-	\$FC58	151	HOME	\$F318	166	RESUME
\$EA69	203	/	\$F6FE	147	HPLOT	\$D96B	177	RETURN
	209	<	\$F7E7	150	HTAB	\$E686	233	RIGHT\$
\$DF65	208	=	\$D9C9	173	IF	\$EFAE	219	RND
	207	>	\$F1DE	139	IN#	\$F721	152	ROT=
\$EBAF	212	ABS	\$DBB2	132	INPUT	\$D912	172	RUN
\$DF55	205	AND	\$EC23	211	INT	\$D8B0	183	SAVE
\$E6E5	230	ASC	\$F277	158	INVERSE	\$F727	153	SCALE=
—	197	AT	\$E65A	232	LEFT\$	\$DEF9	215	SCRN(
\$F09E	225	ATN	\$E6D6	227	LEN	\$EB90	210	SGN
\$F1D5	140	CALL	\$DA46	170	LET	\$F775	154	SHLOAD
\$E646	231	CHR\$	\$D6A5	188	LIST	\$EFF1	223	SIN
\$D66A	189	CLEAR	\$D8C9	182	LOAD	\$DB16	195	SPC(
\$F24F	160	COLOR =	\$E941	220	LOG	\$F262	169	SPEED=
\$D896	187	CONT	\$F2A6	164	LOMEM:	\$EE8D	218	SQR
\$EFEA	222	COS	\$E691	234	MID\$	—	199	STEP
\$D995	131	DATA	\$D649	191	NEW	\$D86E	179	STOP
\$E313	184	DEF	\$DCF9	130	NEXT	\$F39F	168	STORE
\$F331	133	DEL	\$F273	157	NORMAL	\$E3C5	228	STR\$
\$DFD9	134	DIM	\$DE98	198	NOT	\$DB16	192	TAB(
\$F769	148	DRAW	\$F26F	156	NOTRACE	\$F03A	224	TAN
\$D870	128	END	\$D9EC	180	ON	\$F399	137	TEXT
\$EF09	221	EXP	\$F2CB	165	ONERR	—	196	THEN
\$F280	159	FLASH	\$DF4F	206	OR	—	193	TO
\$E354	194	FN	\$DFCD	216	PDL	\$F26D	155	TRACE
\$D766	129	FOR	\$E764	226	PEEK	\$A	213	USR
\$E2DE	214	FRE	\$F225	141	PLOT	\$E707	229	VAL
\$DBA0	190	GET	\$E77B	185	POKE	\$F241	143	VLIN
\$D921	176	GOSUB	\$D96B	161	POP	\$F256	162	VTAB
\$D93E	171	GOTO	\$E2FF	217	POS	\$E784	181	WAIT
\$F390	136	GR	\$F1E5	138	PR#	\$F76F	149	XDRAW
\$F6E9	146	HCOLOR =	\$DAD5	186	PRINT	\$EE97	204	^
\$F3E2	145	HGR	\$DBE2	135	READ			

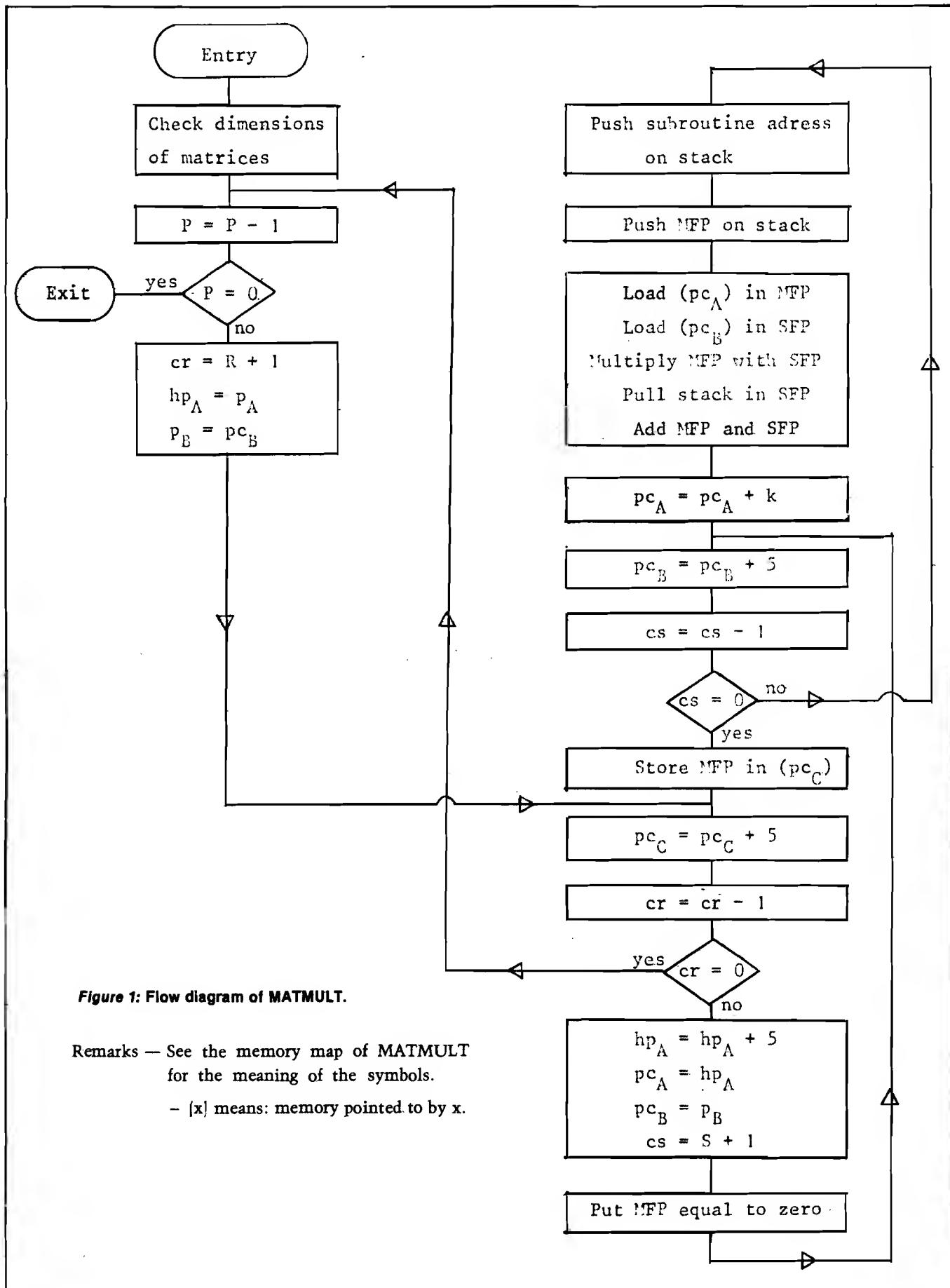
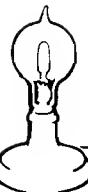


Figure 1: Flow diagram of MATMULT.

Remarks — See the memory map of MATMULT for the meaning of the symbols.

— [x] means: memory pointed to by x.



Skyles Electric Works

BASIC Programmer's, Toolkit™, Disk-O-Pro™, Command-O™

For PET™ Owners Who Want More Fun And Fewer Errors with Their Programs

Here are thirty-five commands you'll need, all on dual chips you can install in two minutes without tools, on any PET or PET system. 2KB or 4KB of ROM firmware on each chip with a collection of machine language programs available from the time you turn on your PET to the time you shut it off. No tape to load or to interfere with any running programs.

For PET/CBM 2001-8, -8N, -16N/B, -32N/B, 3016 and 3032

BASIC Programmers Toolkit™ commands

**AUTO^{ed} DELETE^{ed} RENUMBER^{ed} HELP^{ed} TRACE^{ed}
STEP^{ed} OFF^{ed} APPEND^{ed} DUMP^{ed} FIND^{ed}**

BASIC Programmers Disk-O-Pro™

**CONCAT^{B80} DOPEN^{B80} DCLOSE^{B80} RECORD^{B80} HEADER^{B80} COLLECT^{B80}
BACKUP^{B80} COPY^{B80} APPEND^{B80} DSAVE^{B80} DLOAD^{B80} CATALOG^{B80}
RENAME^{B80} SCRATCH^{B80} DIRECTORY^{B80} INITIALIZE^{BS} MERGE^{BS} EXECUTE^{BS}
SCROLL^{ed} OUT^{ed} SET^{ed} KILL^{ed} EAT^{ed} PRINT USING^{BS} SEND^{BS} BEEP^{BS}**

RUN
?DIVISION BY ZERO ERROR IN 500
READY.
HELP
500 J = SQR(A*B/C)
READY

APPEND INPUT
PRESS PLAY ON TAPE #1
OK
SEARCHING FOR INPUT
FOUND INPUT
APPENDING
READY

RUN
READY
DUMP
A1 = 10
BW = -6 +
CS = "HI"
READY

NOTES:

ed — a program editing and debugging command

B80 — a BASIC command also available on Commodore CBM™ 8016 and 8032 computers.

BS — a Skyles Electric Works added value BASIC command.

BASIC Programmers Toolkit™ is a trademark of Palo Alto IC's.

BASIC Programmers Disk-O-Pro™, Command-O™ are trademarks of Skyles Electric Works.

PET™, CBM™ are trademarks of Commodore Business Machines.

AVAILABLE: USA/CANADA: Please contact your local dealer

England: Calco Software Lakeside House, Kingston Hill, Surrey KT2 7QT

GERMANY: Unternehmensberatung; Axel Brocker | Lennebergestr 4, 6500 Mainz

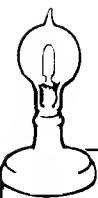
Japan: Systems Formulate, 1-8-17 Yaesu Shinmaki-cho Bldg. 11F Chuo-ku, Tokyo JAPAN 103

Phone or write for Information. We'll be delighted to answer any questions
and to send you the complete information package.



Skyles Electric Works

**231 E South Whisman Road
Mountain View, CA 94041
(415) 965-1735**



Skyles Electric Works

BASIC Programmer's, Toolkit™, Disk-O-Pro™, Command-O™

For CBM™ Owners Who Want More Fun And Fewer Errors with Their Programs

Here are nineteen commands you'll need, on a single chip you can install in two minutes without tools, **on any CBM or CMB system**. 4KB of ROM firmware on each chip with a collection of machine language programs available from the time you turn on your PET to the time you shut it off.

For CBM 8016 and 8032; BASIC 4.0

BASIC Programmers Command-O™

**AUTO^{ed} DUMP^{ed} DELETE^{ed} FIND^{ed} (improved) HELP^{ed} KILL^{ed} OFF^{ed}
TRACE^{ed} (improved) RENUMBER^{ed} (improved) INITIALIZE^{BS} MERGE^{BS} MOVE^{BS}
EXECUTE^{BS} SCROLL^{ed} OUT^{ed} SET^{ed} SEND^{BS} PRINT USING^{BS} BEEP^{BS}**

```
100 GOSUB 180
105 PRINT USING CS, A, BS
130 INPUT "TIME", DS
131 INPUT "DAY", ES
160 IF B...>C THEN 105
180 FOR X=IT09
183 PRINT Y(X):NEXT
184 RETURN
200 I=X/19
READY
RENUMBER 110, 10, 105-184
READY
LIST
100 GOSUB 150
110 PRINT USING CS, A, BS
120 INPUT "TIME", DS
130 INPUT "DAY", ES
140 IF B...>C THEN 110
150 FOR X=IT09
160 PRINT Y(X):NEXT
170 RETURN
200 I=X/19
READY
```

```
MERGE D1 BUY NOW
SEARCHING FOR BUY NOW
LOADING
READY
RENUMBER 100, 10
READY
FIND BS
110 PRINT USING AS, BS, ES - CS - DS
280 BS "NOW IS THE TIME"
READY
```

```
580 BA - BA 1
590 RA 123.5X.92 - BA*10
600 IF BA :143 THEN 580
610 RETURN
620 CS "PROFIT $#, #### ## DAILY"
630 PRINT USING CS, PI
640 DS "LOSS $#, #### ## DAILY"
650 PRINT USING DS, LI
RUN
PROFIT $1, 238.61 DAILY
LOSS $ 0.00 DAILY
READY
```

◀ NOTICE ▶

When you order **Command-O**, we will loan
you a **Toolkit** until we deliver **Command-O**.

◀ NOTICE ▶

PRICES:

BASIC Programmers Toolkit™ (chip only)	\$40.00
BASIC Programmers Disk-O-Pro™ (chip only)	\$75.00
BASIC Programmers Command-O™ (chip only)	\$75.00
Interface boards (needed sometimes)	\$20.00-\$50.00
Instruction Manual (with redeemable \$5.00 coupon)	\$5.00

Shipping and handling \$2.50 USA/Canada, \$10.00 Europe/Asia

California residents please add 6% or 6-1/2% sales tax as required

Reserve your Disk-O-Pro, Command-O today

Toolkit™ immediate delivery, Disk-O-Pro delivery in December, Command-O delivery in January

VISA, MASTERCHARGE ORDERS CALL (800) 538-3083 (except California residents)

CALIFORNIA ORDERS PLEASE CALL (408) 257-9140



Skyles Electric Works

**231 E South Whisman Road
Mountain View, CA 94041
(415) 965-1735**

One Dimensional Life on the AIM 65

This adaptation for the AIM 65 of Millen's "One-Dimensional Life," takes advantage of the AIM's 20-character LED display and its thermal printer.

Larry Kollar
257 W. Wadsworth Hall, MTU
Houghton, Michigan 49931

Thumbing through some back issues of *BYTE*, I came across Jonathan K. Millen's "One-Dimensional Life" (December 1978, pgs. 68-74). This article was particularly interesting, since I own a Rockwell AIM 65 microcomputer and I had been planning to write a two-dimensional Life game which would display each generation on the little printer. Dr. Millen's idea looked much easier to write and would certainly use less paper, since I could simply use the AIM's 20-character alphanumeric display.

Listing 1 is an assembly language listing of the One-Dimensional Life program. The program uses a 20 cell universe, with spaces outside this area being barren. My algorithm differs somewhat from that suggested by Dr. Millen in that two complete arrays are used in calculating each generation; Dr. Millen used a temporary storage space three cells in width, which follows the line of march as each cell is recomputed. I decided that I could write a simpler program by using the extra array.

Listing 1

0200	ORG	\$0200	
0200 A9 20	LDA	#\$20	FILL WORK AND
0202 A2 2B	LDX	#\$2B	DISPLAY ARRAYS
0204 95 00	LBLA	STA	\$0000,X WITH
0206 CA	DEX		
0207 10 FB	BPL	LBLA	ASCII SPACES
0209 A2 00	LDX	#\$00	CLEAR X.
020B 20 93 E9	LBLB	JSR	INALL GET A CHARACTER
020E C9 0D	CMP	#\$0D	CARRIAGE RETURN?
0210 F0 0F	BEQ	LBLD	YES--START LOOPING
0212 C9 2A	CMP	#\$2A	IS IT A '*'?
0214 F0 02	BEQ	LBLC	YES--STORE IT
0216 A9 20	LDA	#\$20	NO--ASSUME A SPACE
0218 95 00	LBLC	STA	\$0000,X AND STORE IT
021A 95 16	STA	\$0016,X	IN BOTH ARRAYS
021C E8	INX		GO TILL 20 CHARS
021D E0 14	CPX	#\$14	DONE YET?
021F 30 EA	BMI	LBLB	NO--GET MORE CHARS
0221 A2 14	LBLD	LDX	START COMPUTING GEN.
0223 18	LBLE	CLC	SETUP FOR ADDITION
0224 B5 14	LDA	\$0014,X	ADD BOTH
0226 75 15	ADC	\$0015,X	BEFORE
0228 75 16	ADC	\$0016,X	THE MIDDLE,
022A 75 17	ADC	\$0017,X	AND THE TWO
022C 75 18	ADC	\$0018,X	FOLLOWING
022E 48	PHA		AND SAVE IT
022F B5 16	LDA	\$0016,X	SEE WHAT WE HAVE
0231 C9 20	CMP	#\$20	IS IT A SPACE?
0233 D0 14	BNE	LBLI	NO--THE CELL IS LIVE
0235 68	PLA		TEST DEAD CELLS
0236 C9 B4	CMP	#\$B4	2 NEIGHBORS?
0238 F0 0B	BEQ	LBLH	YES...
023A C9 BE	CMP	#\$BE	3 NEIGHBORS?
023C F0 0B	BEQ	LBLI	YES...
023E A9 20	LBLF	LDA	NO--IT REMAINS DEAD
0240 95 00	LBLG	STA	\$0000,X PUT IN DISPLAY AREA
0242 4C 54 02	JMP	LBLJ	AND GO FOR MORE
0245 A9 2A	LBLH	LDA	#\$2A BIRTH....
0247 D0 F7	BNE	LBLG	
0249 68	LBLI	PLA	LIVING CELLS--TEST
024A C9 BE	CMP	#\$BE	2 NEIGHBORS?
024C F0 F7	BEQ	LBLH	YES, IT SURVIVES
024E C9 D2	CMP	#\$D2	4 NEIGHBORS?
0250 F0 F3	BEQ	LBLH	YES....
0252 D0 EA	BNE	LBLF	NO--THIS ONE DIES

(continued)

To run the program, type [* = 200], [G], (space). Set up the first generation by using asterisks for living cells; spaces, or any other characters, will be considered dead and will be entered as spaces. The program will begin executing if RETURN is hit or 20 cells have been typed in. If the program is stopped, it can be restarted at [* = 0221] and it will continue executing. See table 1 for other locations.

Comments

Obviously, a 20 cell universe is going to have some restrictions. The pattern shown in Photo 1 of Dr. Millen's article runs out of space on my display after the last generation shown on the video screen. Many other patterns quickly run out of space. But the program gives one a good flavor for what can and cannot be done in One-Dimensional Life, and there is enough room for discoveries, such as a period 3 glider eating the period 1 glider (see figure 1).

Also, the boundaries may help some patterns stabilize more quickly. Filling the entire display with living cells yields an oscillator with period 12. Gliders, no matter what stage they are in when they hit the edge, become flip-flops or oscillating patterns. Some oscillators will continue undisturbed when close enough to the edge for a part to extend into barren territory, others will mutate into blinkers or flip-flops.

Like conventional Life patterns, One-Dimensional Life patterns tend to mutate to more symmetrical patterns. However, one-dimensional patterns show a tendency to fight harder to survive than their conventional counterparts.

Figures 2 - 4 show some other results.

Listing 1 (continued)

0254 CA	LBJ	DEX	GENERATION FINISHED?
0255 10 CC		BPL	NO--CONTINUE CHECKS
0257 20 F0 E9		JSR	OUTPUT CR & LF
025A A2 00		LDX	#\$00 DISPLAY GENERATION
025C B5 00	LBLK	LDA	\$0000,X GET NEW GENERATION
025E 95 16		STA	\$0016,X COPY INTO WORK ARRAY
0260 20 BC E9		JSR	OUTALL AND DISPLAY IT
0263 E8		INX	
0264 E0 14		CPX	#\$14 UNTIL ALL FINISHED,
0266 30 F4		BM1	LBLK KEEP GOING
0268 A0 00		LDY	#\$00 DELAY LOOP--CLEAR Y
026A A9 71	LBLL	LDA	#\$71 SET UP FOR
026C 8D 08 A8		STA	TTWOL A 3/4 SECOND
026F A9 0B		LDA	#\$0B DELAY...
0271 8D 09 A8		STA	TTWOH
0274 20 1B EC		JSR	TIMER CALL INNER TIMER
0277 C8		INY	AND DO IT AGAIN
0278 D0 F0		BNE	LBLL UNTIL 3/4 SEC. BURNS
027A 20 07 E9		JSR	RCHEK DROP OUT ON ESCAPE
027D 4C 21 02		JMP	LBLD AND GO TO NEXT GEN.

Table 1: Locations of external subroutine calls and entry points.

Location of call	Subroutine description
D20B	INALL Input an ASCII character into A
0257	CRLF Output a carriage return and a line feed
0260	OUTALL Output ASCII character in A to display
0274	TIMER Count a delay in microseconds. The delay time is stored in hexadecimal in locations A808 and A809 hex. These locations must be reloaded everytime DE2 is called.
027A	RCHEK Scans the keyboard, returns to Monitor on ESC, caller on no entry, wait on (space) until another (space) is entered.

Table 2: Author's names for various patterns.

Pattern	Name	Period
__**__	Blinker	2
__**__*	Railroad crossing	2
__**___*	Long RR crossing	2
*___***	Glider	1
*___*****	Spaceship	3
___***	Heavy spaceship	3
*****	Blinker seed	—

An asterisk (*) denotes a live cell.

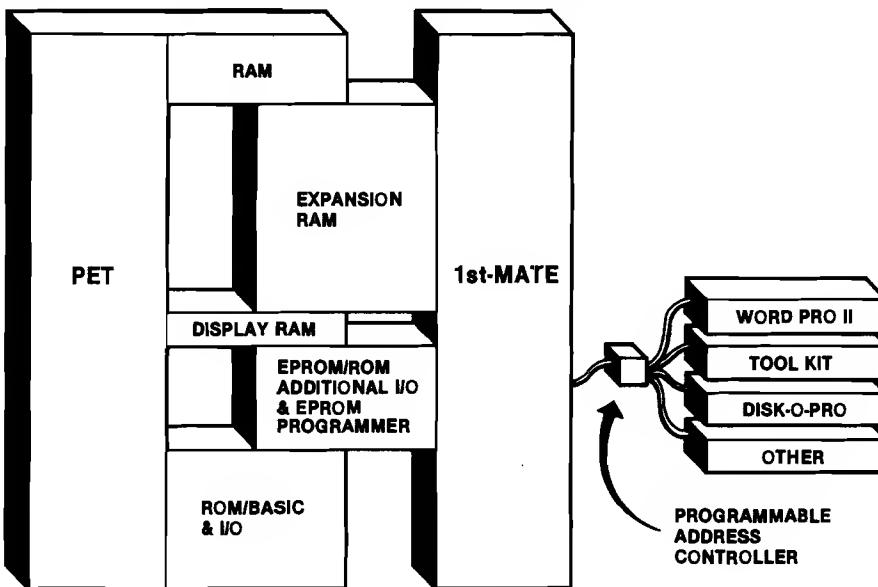
A space (—) denotes a dead cell.

I am using more or less conventional Life terms to denote these patterns. Dr. Millen named the glider in his article.

1st-MATE™

IS THE ULTI-MATE EXPANSION FOR YOUR PET

- Adds 16 to 32K RAM
- Supports additional 16K EPROM/ROM with programmable address selection circuitry—Permits up to six 4K memory segments to share a single 4K address
- Programs EPROMs on board
- Adds 32 additional I/O lines, 4 timers, and 2 shift registers
- Adds customization area
- Uses existing or external housing and power
- Includes circuitry to support an externally mounted reset switch



1st-MATE

Thousands of our expansion boards for the AIM, SYM, and KIM are in use in industrial, scientific, university, and business environments. 1st-MATE is the first of a line of multifunction expansion boards and accessory products planned to supplement and extend the capabilities of the PET/CBM microcomputers. 1st-MATE has evolved from the popular DRAM PLUS currently being used with the AIM, SYM, and KIM. It has been customized to provide special support and features for the PET.

1st-MATE was first demonstrated at Commodore Business Machines' Philadelphia area Equipment Systems Show, December 13-14, 1980.

1st-MATE is available for demonstration and immediate delivery from local computer stores carrying CBM products.

TCB 110-16	1st-MATE, 16K RAM, with cable	\$395.00
TCB 110-32	1st-MATE, 32K RAM, with cable	475.00

Prices quoted US — does not include shipping & handling.

To obtain the name and location of your nearest dealer call or write:



MICRO

New Publications

Mike Rowe
New Publications
P.O. Box 6502
Chelmsford, MA 01824

This column lists new publications received for review and also reports on pertinent publication announcements received from book and periodical publishers. Some works mentioned here may be reviewed by MICRO at a later date.

General 6502

Microcomputer Systems Principles Featuring the 6502/KIM by R.C. Camp, T.A. Smay, and C.J. Triska. Matrix Publishers, Inc. [30 NW 23rd Place, Portland, Oregon 97210], 1978, viii, 548 pages, illustrated, 6 x 9, paperbound.

ISBN: 0-916460-27-4 \$15.95

A computer engineering textbook introducing microprocessors and emphasizing hands-on experience with the KIM-1 microcomputer.

CONTENTS: *Preface.* *Introduction to Microcomputer-based Design*—Evolution of the Microcomputer/Microprocessor Applications; Engineering Design of Microcomputer-based Products; Educational Demands Created by the Microprocessor Objectives of this Book. *General Aspects of Microprocessor-based Systems*—Microprocessors and Microcomputers; Classification of Computers and Computer Systems; General Features of Microcomputer-based Systems; Information Flow in Microcomputers; Central Processor Hardware Elements; Addressing Modes; Microprocessor Instructions Sets; Microprocessor Word Length; Symbolism in Digital Computers; Arithmetic Operations in Microcomputers; Interrupts and Subroutines; Technological Factors in Microprocessors. *The MCS6502 Microprocessor and Peripheral Parts*—Introduction to MCS6502; Programming Model; Data Paths; Concept of Operation of MCS6502 Instructions; Complete Description of Operation Codes; MCS6502 Specifications; Peripheral Interface Chips; Example Problems. *Software Aids*—Introduction; The Software Design Process; Elements of Program Translation; Text Editors; Simulators; Special Program Debug Features; In-circuit Emulation; Logic State Analyzers; Prom Programmers. *Micro-*

computer Interfacing and System Design—Introduction; Guidelines for System Design; Miscellaneous Advice on System Design; Interfacing Examples; Input/Output—TTL, Speed, Bits, Serial/Parallel Conversions; Address Maps and Organization—Memory and I/O Selection; System Design Examples. *Introduction to the M6800 Microprocessor*—Introduction; Principal Characteristics; Some MCS6502 and M6800 differences; M6800 Programming; Electrical Characteristics of the M6800; M6800 Microcomputer Example; Example Problems. *Introduction to the 18080 Microprocessor*—Characteristics; 18080 Architecture and Programming Model; Data Paths; I8080 Instruction Set; I8080 Example Program; Electrical Characteristics of the I8080. An *MCS6502-Based Microcomputer—The KIM-1*—Introduction; What is a KIM-1; The KIM-1 System: [A micro versus a mini]; An Example Program; KIM-1 Memory Map and Table; Machine Code Example; Entering Example Code into KIM-1; Execution of Example from the Keyboard; Decimal or Binary Code; KIM-1 Keyboard Key Functions; Operating the KIM-1 via Teletype; Adding an Audio-tape Recorder to the KIM-1; The KIM-1 Display. *Appendices*: A. User's Guide to the MDT 650; B. Operating Principles of the KIM-1 Monitor and On-Board I/O hardware.

The Best of MICRO, Volume 3 by *MICRO: The 6502 Journal*. The Best of MICRO Series (ISSN: 0271-8189), Micro Ink, Inc. [P.O. Box 6502, Chelmsford, Massachusetts 01824, 1980, 320 pages, illustrated, 8 3/8 x 10 7/8, paperbound. ISBN: 0-938222-03-1 \$10.00

A selection by MICRO's editors of articles appearing in the magazine's volume 3 [June 1979-May 1980].

CONTENTS: *AIM/SYM/KIM*—[26 articles]. *Apple*—Programmers' Aids (6 articles); Graphics Programs (4 articles); Useful Utilities (5 articles); Fun, Games, and Projects (5 articles); Reference and Educational (7 articles); *Ohio Scientific*—[14 articles]. *PET/CBM*—[15 articles]. *General*—[9 articles]. *Author Index*.

General Microcomputer

Funding Report for Microcomputers by Bell & Howell Audio-Visual Products Division [7100 N. McCormick Road, Chicago, Illinois 60645], issued 1980 (undated), 44 pages, 8 1/2 x 11, paperbound.

\$5.00

A booklet designed to help U.S. educational institutions identify sources of public and private funding for the acquisition of microcomputer technology applied to instruction. The information provided covers conditions as they existed in the fall of 1979.

CONTENTS: Introduction. The Appropriate Federal Titles for Microcomputer Funding. Comments from State Departments of Education. Local Funding and Local Budgets. Proposal Development. Successful Proposals. Recommendations. Federal and State Contacts for Additional Information. Publications. Definitions. Other Sources of Funds.

Son of Cheap Video by Don Lancaster. Howard W. Sams & Co., Inc. [4300 West 62nd St., Indianapolis, Indiana 46268], 1980, 224 pages, paperbound. ISBN: 0-672-21723-6 \$8.95

A sequel to the author's *Cheap Video Cookbook*, *Son of Cheap Video* (and its predecessor) shows low cost ways of getting alphanumeric and graphics video out of a microcomputer and onto an ordinary television set.

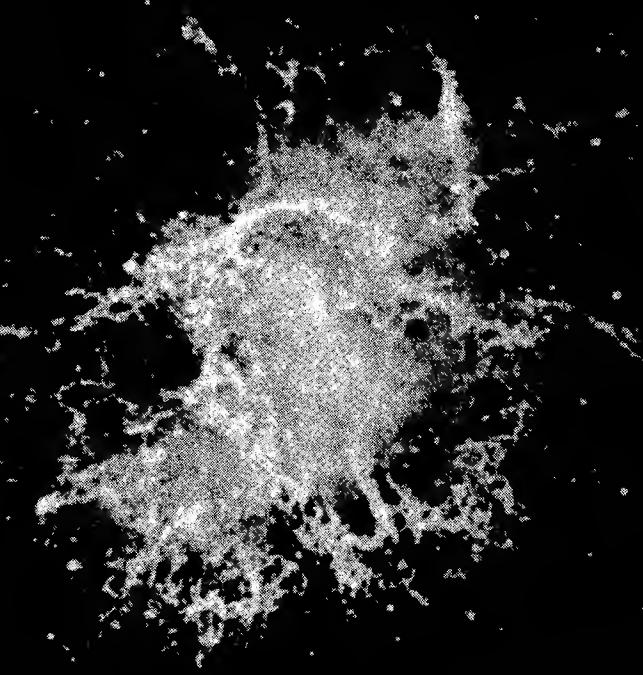
CONTENTS: *Scrungy Video*—How Video Works; A Bottom Line Scrungy Video System. *The Snuffer—Super Simple Transparency*—The Method; Building the Snuffer; A Snuffer Demonstration; Alternate-Field Snuffling; The Best of Both Worlds; Some Perspective. *Custom Characters—EPROMs as Character Generators*; Graphics Chunks; Using EPROMs; Designing a Character Set; Building EPROM Adaptor Module "E"; *Checkout. A Music Display*—The Display Plan; A Character Set; Music Software; Test and Debug; Polyphony. *8080 Cheap Video—Heath H8 Hardware*—Hardware; Speed Doubling Via A9 Switching; Front-panel Interaction; A Keyboard Serial Adaptor. *8080 Cheap Video—Heath H8 Software*—Test Software; Self-Modifying Versus Brute-Force Scans; 1 x 56 Scan Programs; TV Retrace Hassles; More Characters; 12 lines of 80 Characters; 8080 Cursor Software. *Lower-Case Hardware For Your Apple II*—Some Details; Hardware Changes; Initial Checkout. *Lower-Case Software For Your Apple II*—Direct Entry; Four Utility Sequences; A Lower-Case Tester; A Useful Display Program; A Full-Performance Lower-Case Editor; A Full Dual-Case Editing System; Further Hardware Mods. *APPENDIX A*: More Character Generator Details; *APPENDIX B*: Pinouts of selected IC's; *APPENDIX C*: Printed Circuit Patterns.

General Computer

Computer Dictionary by Charles J. Sippl and Roger J. Sippl. Howard W. Sams & Co., Inc. [4300 West 62nd St., Indianapolis, Indiana 46268], 3rd edition 1980, 5 3/8 x 8 1/2, paperbound. ISBN: 0-672-21652-3 \$12.95

The authors call this a "browsing" dictionary, with long definitions and explanations designed to teach users about products, procedures, problems, and applications.

A BRILLIANT FUTURE FOR YOUR AIM-65 WITH THE BANKER MEMORY™



Your 36K of free address space is the AIM's most valuable and limited resource. With today's large capacity RAM boards, ROM boards, disk systems, video boards, and other expansion accessories it is easy to deplete this resource before the application requirement is satisfied. MTU has solved this problem.

THE BANKER MEMORY contains 32K of RAM, 4 PROM sockets for 2716/2732/2332, a PROM programmer, 40 bits of parallel I/O, and 4 timers from two 6522 I/O chips. Addressing is extremely flexible with the RAM independently addressable in 4K blocks, PROM's independently addressable, and I/O addressable anywhere on a 64 byte boundary (even in AIM's I/O area at AXXX by adding a single jumper to the AIM).

This may sound familiar, but read on! Unlike other AIM compatible memory boards, THE BANKER MEMORY has on-board bank-switching logic! The four 8K blocks of RAM plus the 4 PROM sockets make up 8 **resources**, each associated with a bit in an Enable Register. Through this Enable Register resources may be turned on and off under software control. When a resource is off, its address space is freed for other uses. You can even put BANKER resources at the same address and switch among them for virtually unlimited RAM and PROM expansion! You can even have multiple page zero's and stacks! Do you need 160K byte of memory? It only takes 5 of THE BANKER MEMORY boards and you end up with 5 page zeros and stacks to boot!

There's more! The BANKER MEMORY also incorporates 18 bit addressing which allows for the 256K address spaces of the future. RAM, PROM, and I/O each has its own full 18 bit address decoder which allows these resources to be in different 64K banks. This board and other MTU products, such as our 320 by 200 dot VISIBLE MEMORY and Floppy Disk Controller with 16K DMA RAM, can turn your AIM into a truly powerful 6502 computer that far surpasses the packaged systems in functional performance.

INTRODUCTORY SPECIAL K-1032-1 32K BANKER MEMORY FULLY ASSEMBLED AND TESTED \$395.00 (\$450.00 as of March 1, 1980) or the K-1032-2 16K RAM only with bank switching and 18 bit address bus only \$295.00

Isn't it time you took a closer look at MTU — we offer you power now with an eye to the future.

WRITE OR CALL TODAY FOR OUR 48 PAGE FALL 1980 6502 CATALOG
International requests include \$1.00

VISA and MASTERCARD accepted

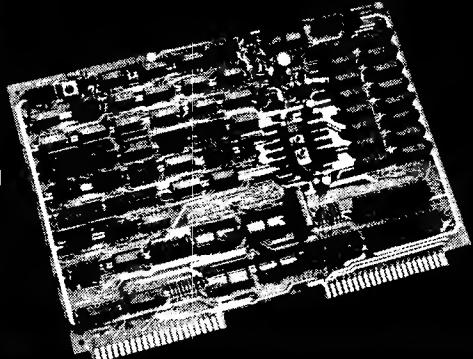


Photo credit:

SUPERNOVA CRAB NEBULA:
Palomar Observatory,
California Institute of Technology



Micro Technology Unlimited

2806 Hillsborough Street
P.O. Box 12106
Raleigh, NC 27605, U.S.A.
(919) 833-1458

POWER A PLUS II™

Check out the specifications on this industrial quality power supply.

INPUT SPECIFICATIONS: 105-125/210-250 VAC, 50-60 Hz

OUTPUT SPECIFICATIONS

OUTPUT	RIPPLE & NOISE	REGULATION
+5VDC @ 5.0A (OV, CF, RV)	10 mv. max. @ 0.0 to 4.5A	± 0.1%, line and load with 10% line change
+12 VDC @ 0.5A (TO, OV)	15 mv max. @ 0. to 0.5A	± 0.1%, line and load with 10% line change
+24 VDC @ 1.0A* (1.5A surge) (TO, OV, RV)	24 mv max. @ 0.0 to 1.0A	± 5% nominal, ± 7% max.
Optional -5 VDC @ 0.5A (TO, OV, RV)	15 mv max. @ 0.0 to 0.5A	+ 0.3%, line and load with 10% line change

Protection Key: OV - over voltage, CF - current foldback
RV - reverse voltage, TO - thermal overload

Weighs 4 pounds. This open frame model has all of the voltages required by the AIM/SYM/KIM, plus extra voltages and capacities for driving additional expansion boards and devices. Includes fuse holder, fuse, line cord, and switch. No other power supply you can buy offers this power, combination of voltages, quality and low price.

POWER A PLUS II \$65.

Dealer and OEM Inquiries Invited

Prices quoted US — does not include shipping & handling.



34 Chelmsford St., Chelmsford, MA 01824

617/256-3649

DRAM PLUS™

DRAM PLUS offers the most powerful memory expansion capabilities available for the AIM, SYM, & KIM microcomputers. Its many important features include:

- 16K or 32K Dynamic RAM with all refresh handled on the board and completely transparent to the host microcomputer.
- Memory does not have to be addressed as a single 16K or 32K segment. 4K segments of memory may be placed on 4K boundaries.
- Up to 16K ROM/EPROM with provision for four ROMs or EPROMs: 2716/2516 2K EPROMs, 2732/2532 4K EPROMs, or 2332 ROMs. These may be mixed on the board.
- Two Versatile Interface Adapters, each with two 8-bit I/O ports, additional handshaking lines, two timers, and a serial-to-parallel shift register.
- Prototyping Area has space for adding circuits: memory write protection, floppy disk controller, communications devices, A/D or D/A, etc.
- EPROM Programmer handles all four types of EPROM: 2716/2516 2K and 2732/2532 4K.
- Simple Power Requirements of +5 volts at 1 amp and +12 volts at 150 milliamps. On board regulators permit unregulated power to be used.

DRAM PLUS: 16K RAM \$295, 32K RAM \$395

Dealer and OEM Inquiries Invited

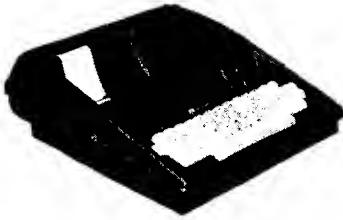
Prices quoted US — does not include shipping & handling.



34 Chelmsford St., Chelmsford, MA 01824

617/256-3649

AIM PLUS II™



Power and Protection for the AIM

This heavy duty enclosure provides protection for the AIM, has provision for the addition of one expansion board, and has a high quality power supply built-in. Turn your naked AIM into an attractive, compact system. The Power supply provides +5V @ 5 amps, enough for the AIM and several expansion boards, +24V @ 1 amp with surge capability to handle the AIM Printer, and includes +12V for use on various expansion boards and other devices.

The enclosure is made of tough, commercial strength thermoformed plastic and provides easy access to the printer and the expansion connectors. No disassembly of your AIM or cutting is required.

Priced at just \$125.00 US, this is certainly the best way to give your AIM the protection it deserves and the power it requires.

Prices quoted US — does not include shipping & handling.



34 Chelmsford St., Chelmsford, MA 01824

617/256-3649

VIDEO PLUS II™

What could you add to the Video PLUS board to make it better?

YOU COULD—

- Put the character generator in EPROM so that the user could define his own character set - 128 or 256 characters
- Make the character width programmable so that up to 120 characters per line are possible in a dense mode, or well separated 80 characters in a word processing mode
- Add extra RAM for program execution
- Provide all of the necessary software to interface to an AIM, SYM, or KIM on an EPROM
- Provide a number of additional display features such as flicker free operation, reverse video, character blank/unblank, support for keyboards with inverted strobes and/or data, ...
- Improve the ASK Video Software so that it does not use any of page zero or page one, making it totally transparent to the AIM, SYM and KIM monitors, editors, assemblers, ... (see note)
- Provide DIP switches to select the various options
- Provide full support, including software, for running the board as a stand-alone terminal
- Provide an asynchronous communication facility with RS232 and 20 Me Current loop operation at 50 to 19,000 baud

AND WE DID! Video Plus II has all of the features of the original Video Plus, and all of the above features as well.

Note: The enhanced Video Plus II software is available to Video Plus owners at a nominal charge - \$10 for cassette and documentation.

VIDEO PLUS II: Standard board \$295

Options: Additional 4K RAM \$50

6502 Standalone processor \$20

Communications provision \$35

Dealer and OEM Inquiries Invited

Prices quoted US — does not include shipping & handling.



34 Chelmsford St., Chelmsford, MA 01824

617/256-3649

Increase KIM-1 Versatility at Low Cost

If KIM's primary address decoder is moved off-board to a small expansion board, it becomes possible to add other I/O devices in page 5 without developing bus contention with KIM's regular I/O ports. Also, further expansion is made easier, and KIM's whole memory map is more efficiently used.

Ralph Tenny
P.O. Box 545
Richardson, Texas 75080

I/O PORT	START ADDR.	END ADDR.	ADDR. LINES
0	1400	147F	K0/8, A0-A7
1	1480	14FF	K1/8, A0-A7
2	1500	157F	K2/8, A0-A7
3	1580	15FF	K3/8, A0-A7
4	1600	167F	K4/8, A0-A7
5	1680	16FF	K5/8, A0-A7

Table 1: The new decoder chip allows addition of six more I/O ports, each 128 bytes wide. Any 6502 family programmable peripheral device can be used, as well as 128 x RAM or 128 x PROM.

The KIM-1 memory map is fairly well organized for those who need a 5K+ system, provided no additional I/O channels are needed (see figure 1). However, the area presently dedicated to I/O (1400-177F) is not exclusively decoded. That is, devices enabled by K5 will encounter bus contention from the 6530 I/O registers without further decoding. At first, it is almost obvious that any additional decoding must result in trace cutting on the KIM board, as a minimum.

If U4 (74LS145) is moved off-board and addressed by the same lines as before, it is possible to add another 74LS145 or 7445 (same pinout, same truth table) driven by A7, A8 and A9 and enabled by K5 (see figure 2). The eight outputs (shown as K0/8 through K7/8) each decode 128 bytes of the 1K bytes enabled by the previous connection of K5. The new K5 is made up of K6/8 and K7/8 connected together and connected to KIM via pin H of the Application connector. The pull-up resistor which served the original K5 now serves the new K5.

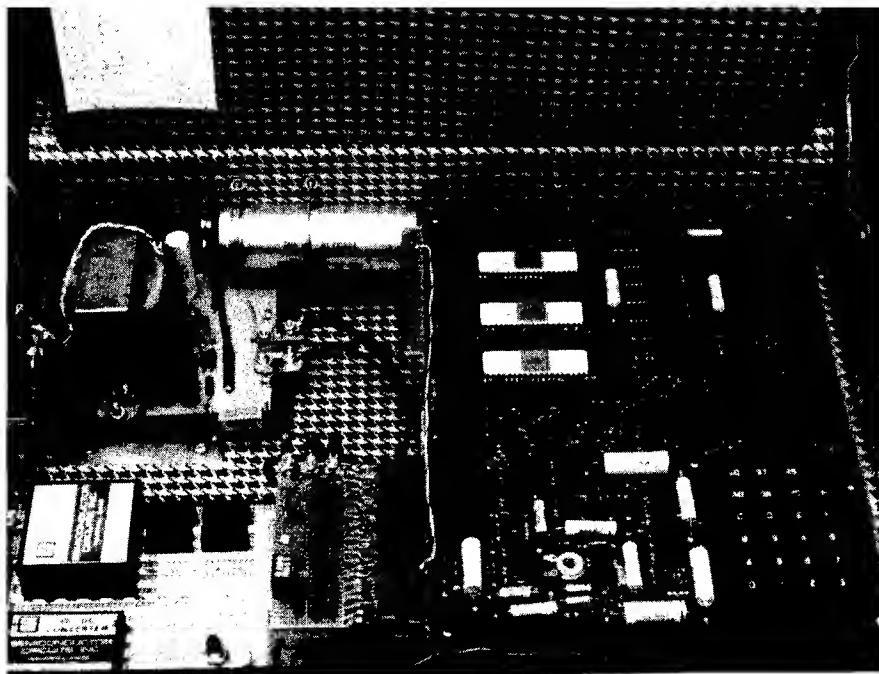
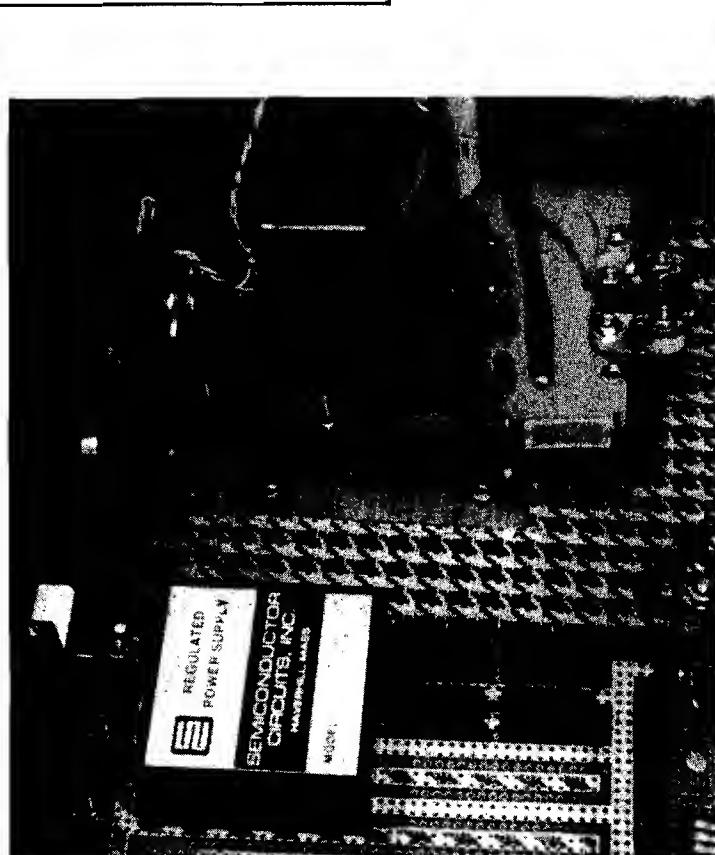
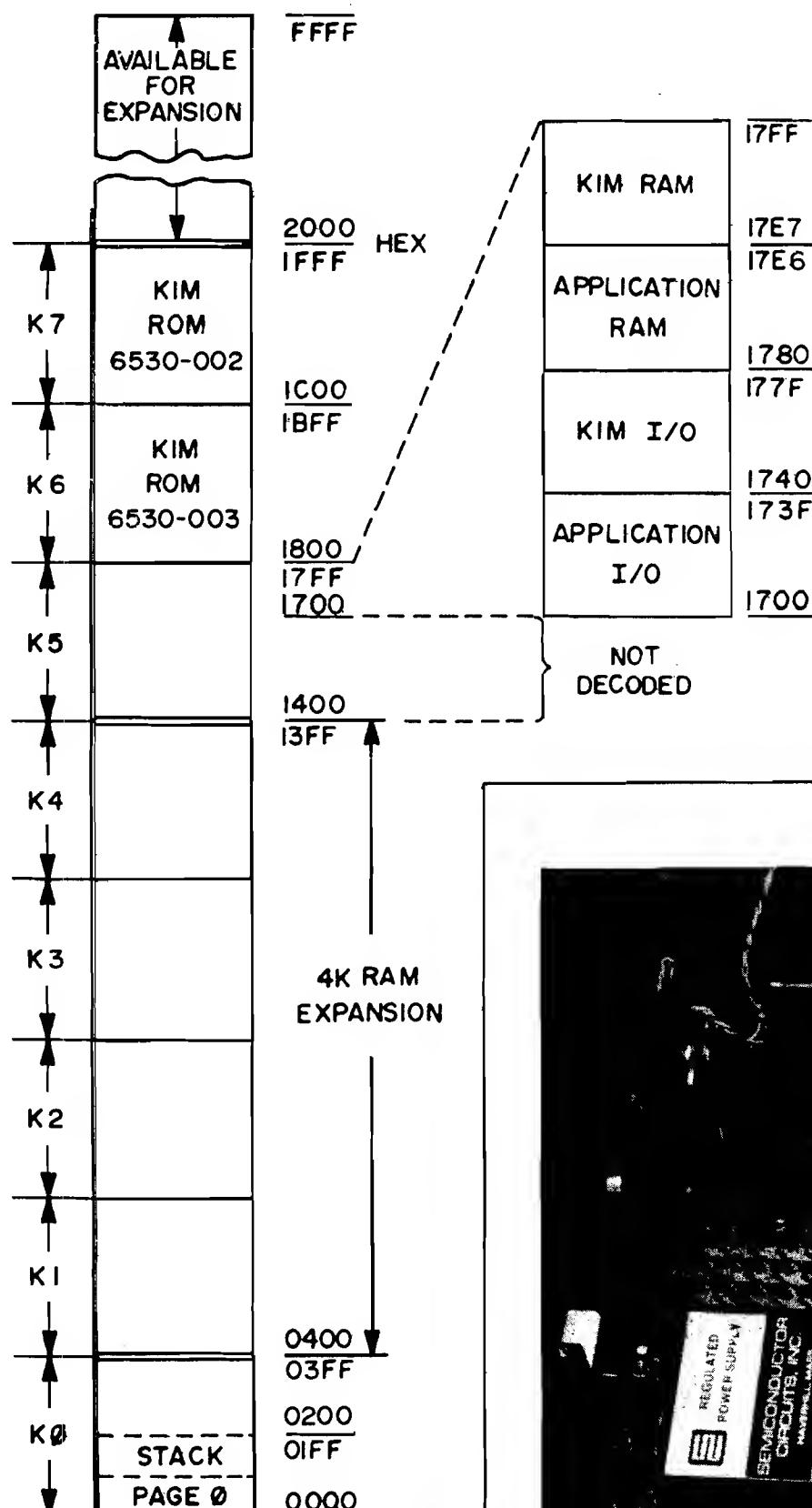


Figure 1: KIM-1 Memory Map; note that the memory area decoded by K5 is not totally decoded so that any other ports in the same area will conflict with existing KIM ports.



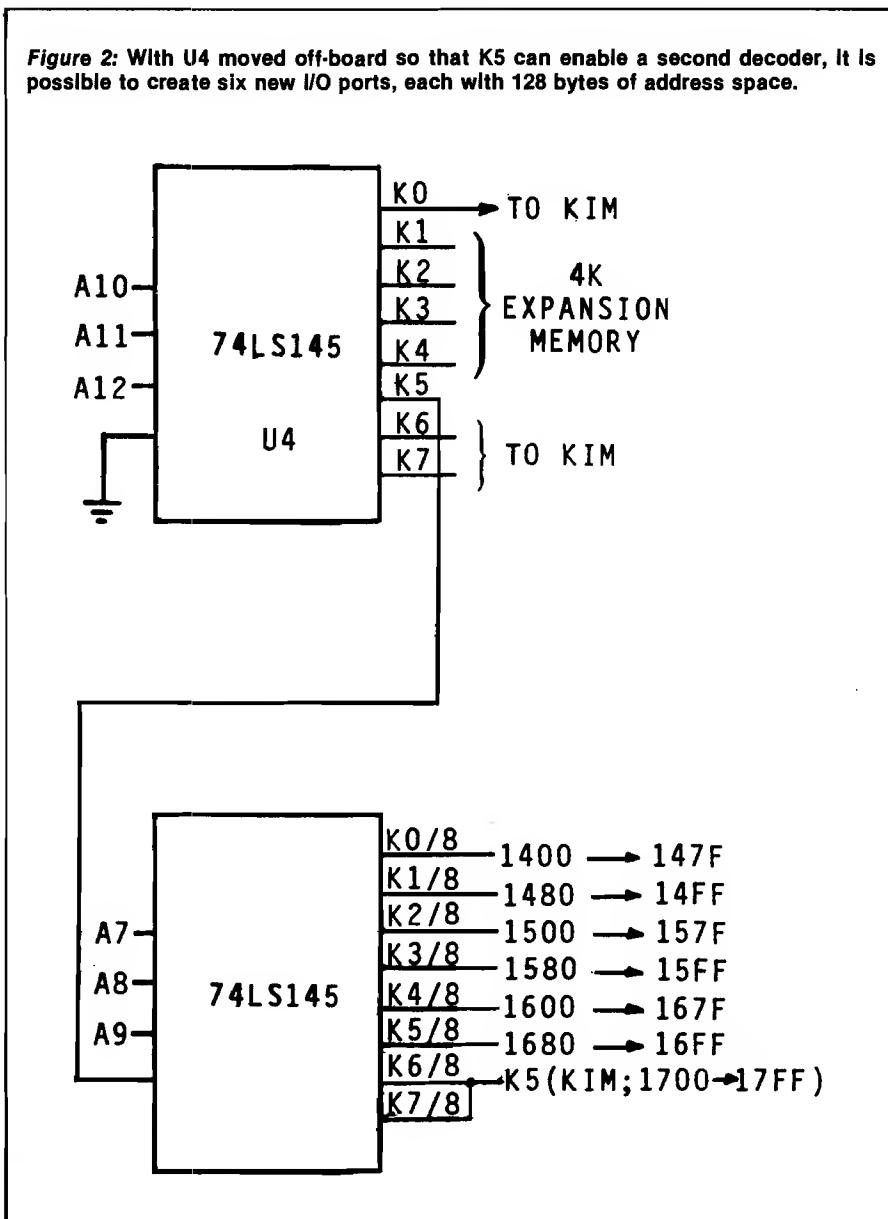
Since K1, K2, K3 and K4 are needed off-board for memory expansion, they do not need to be returned to KIM. K0 and K7 (from the re-located U4) are connected to their original exit point from KIM (pins B and J, respectively, on the Application connector). Since K6 originally did not exit on the Application connector, use K4's old home (pin F). At the old U4 socket, jumper pin 5 to pin 7 so that K6 is routed over its old path.

At this point, KIM's memory map has not really been changed. However, there are now six 128 byte blocks which are decoded for whatever may be needed. If you need more I/O, it is very easy to add up to 96 additional I/O lines by using six 6522's, 6520's, etc.

Table 1 summarizes the connections for these devices, along with the addresses they will respond to. Note that so many additional devices will probably cause overload on the processor address lines, so address buffers on the lower seven lines would be needed. If all 16 address lines are buffered at the expansion connector, there will be adequate drive for almost any desired expansion.

If additional memory expansion is needed, simply follow the guidelines in the *KIM-1 User Manual*, Chapter 6. That scheme is completely compatible with the circuitry shown here except that U4 has been moved off-board and the total drive load on the processor is less than before.

Figure 2: With U4 moved off-board so that K5 can enable a second decoder, it is possible to create six new I/O ports, each with 128 bytes of address space.



MICRO

Microbes and Updates

Mike Rowe
Microbes & Updates
P.O. Box 6502
Chelmsford, MA 01824

In our listing of Roger C. Crites' "Stuffit" (MICRO 31:45), we inadvertently omitted line 340 and have a correction to line 90:

```
90 GET A$:1F A$="" GOTO 90
340 ?"STRIKE ANY KEY TO
CONTINUE"
```

Lines 415 and 465 (not 15 and 65) are the ones that are ineffective on new PETs.

Also, the following abbreviations were used in the BASIC listing:

?	PRINT
cs	clear screen
ch	cursor home
cl, cr, cd, cu	cursor left, right, down and up
{10 cd}	10 successive cursor downs
rv	reverse field
of	off

John P. Hill of Greenville, South Carolina, discovered that we omitted two lines from listings in Brooke W. Boering's "Multiplying on the 6502" (31:71). In figure 2, the portion starting at RMUL4 should read:

```
1032 66 53 RMUL4 ROR XTNDH
1034 66 52 ROR XTNDL
1036 66 51 ROR ACH
1038 66 50 ROR ACL
103A 88 DEY
103B D0 E3 BNE RMUL2
103D 60
```

In figure 3, the portion beginning at MUL3X should read:

```
104D A5 50 MUL3X LDA ACL
104F 4A LSR A
1050 90 0E BCC MUL4X
```

The addresses are all incremented by two and the next to last line now should read:

```
1068 D0 E3 BNE MUL3X
```

Eugene Weiner (Weiner, Defjong and Lenth), "A Random-Character Morse Code Teacher for the AIM 65 (31:21), has pointed out two errors in the listings that were not in the original:

```
0F77 B9 00 0F LDA $0F00,Y
instead of
0F77 AD 00 0F LDA $0F00
```

In the BASIC listing, line 151 should read: Z = S:X = 0, not Z = S:X+0.



The Newest In

Apple Fun

We've taken five of our most popular programs and combined them into one tremendous package full of fun and excitement. This disk-based package now offers you these great games:

Mimic—How good is your memory? Here's a chance to find out! Your Apple will display a sequence of figures on a 3 x 3 grid. You must respond with the exact same sequence, within the time limit.

There are five different, increasingly difficult versions of the game, including one that will keep going indefinitely. Mimic is exciting, fast paced and challenging—fun for all!

Air Flight Simulation—Your mission: Take off and land your aircraft without crashing. You're flying blind—on instruments only.

A full tank of fuel gives you a maximum range of about 50 miles. The computer will constantly display updates of your air speed, compass heading and altitude. Your most important instrument is the Angle of Ascent/Bank Indicator. It tells if the plane is climbing or descending, whether banking into a right or left turn.

After you've acquired a few hours of flying time, you can try flying a course against a map or doing aerobatic maneuvers. Get a little more flight time under your belt, the sky's the limit.

ColorMaster—Test your powers of deduction as you try to guess the secret color code in this Mastermind-type game. There are two levels of difficulty, and three options of play to vary your games. Not only can you guess the computer's color code, but it will guess yours! It can also serve as referee in a game between two human opponents. Can you make and break the color code...?

Star Ship Attack—Your mission is to protect our orbiting food station satellites from destruction by an enemy star ship. You must capture, destroy or drive off the attacking ship. If you fail, our planet is doomed...

Trilogy—This contest has its origins in the simple game of tic-tac-toe. The object of the game is to place three of your colors, in a row, into the delta-like, multi-level display. The rows may be horizontal, vertical, diagonal and wrapped around, through the "third dimension". Your Apple will be trying to do the same. You can even have your Apple play against itself!

Minimum system requirements are an Apple II or Apple II Plus computer with 32K of memory and one minidisk drive. Mimic requires Applesoft in ROM, all others run in RAM or ROM Applesoft.

Order No. 0161AD \$19.95

Paddle Fun

This new Apple disk package requires a steady eye and a quick hand at the game paddles! It includes:

Invaders—You must destroy an invading fleet of 55 flying saucers while dodging the carpet of bombs they drop. Your bomb shelters will help you—for a while. Our version of a well known arcade game! Requires Applesoft in ROM.

Howitzer—This is a one or two person game in which you must fire upon another howitzer position. This program is written in HIGH-RESOLUTION graphics using different terrain and wind conditions each round to make this a demanding game. The difficulty level can be altered to suit the ability of the players. Requires Applesoft in ROM.

Space Wars—This program has three parts: (1) Two flying saucers meet in laser combat—for two players, (2) two saucers compete to see which can shoot out the most stars—for two players, and (3) one saucer shoots the stars in order to get a higher rank—for one player only. Requires Applesoft.

Golf—Whether you win or lose, you're bound to have fun on our 18 hole Apple golf course. Choose your club and your direction and hope to avoid the sandtraps. Losing too many strokes in the water hazards? You can always increase your handicap. Get off the tee and onto the green with Apple Golf. Requires Applesoft.

The minimum system requirement for this package is an Apple II or Apple II Plus computer with 32K of memory and one minidisk drive.

Order No. 0163AD \$19.95

Solar Energy For The Home

With the price of fossil fuels rising astronomically, solar space-heating systems are starting to become very attractive. But is solar heat cost-effective for you? This program can answer that question.

Just input this data for your home: location, size, interior details and amount of window space. It will then calculate your current heat loss and the amount of gain from any south facing windows. Then, enter the data for the contemplated solar heating installation. The program will compute the NET heating gain, the cost of conventional fuels vs. solar heat, and the calculated payback period—showing if the investment will save you money.

Solar Energy for the Home: It's a natural for architects, designers, contractors, homeowners...anyone who wants to tap the limitless energy of our sun.

Minimum system requirements are an Apple II or Apple II Plus with one disk drive and 28K of RAM. Includes AppleDOS 3.2.

Order No. 0235AD (disk-based version) \$34.95

Math Fun

The Math Fun package uses the techniques of immediate feedback and positive reinforcement so that students can improve their math skills while playing these games:

Hanging—A little man is walking up the steps to the hangman's noose. But YOU can save him by answering the decimal math problems posed by the computer. Correct answers will move the man down the steps and cheat the hangman.

Spellbinder—You are a magician battling a computerized wizard. In order to cast death clouds, fireballs and other magic spells on him, you must correctly answer problems involving fractions.

Whole Space—Pilot your space craft to attack the enemy planet. Each time you give a correct answer to the whole number problems, you can move your ship or fire. But for every wrong answer, the enemy gets a chance to fire at you.

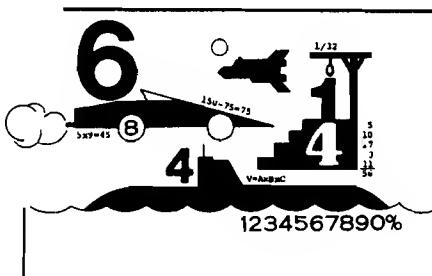
Car Jump—Make your stunt car jump the ramps. Each correct answer will increase the number of buses your car must jump over. These problems involve calculating the areas of different geometric figures.

Robot Duel—Fire your laser at the computer's robot. If you give the correct answer to problems on calculating volumes, your robot can shoot at his opponent. If you give the wrong answer, your shield power will be depleted and the computer's robot can shoot at yours.

Sub Attack—Practice using percentages as you maneuver your sub into the harbor. A correct answer lets you move your sub and fire at the enemy fleet.

All of these programs run in Applesoft BASIC, except Whole Space, which requires Integer BASIC.

Order No. 0160AD \$19.95



Skybombers

Two nations, separated by The Big Green Mountain, are in mortal combat! Because of the terrain, their's is an aerial war—a war of SKYBOMBERS!

In this two-player game, you and your opponent command opposing fleets of fighter-bombers armed with bombs and missiles. Your orders? Fly over the mountain and bomb the enemy blockhouse into dust!

Flying a bombing mission over that innocent looking mountain is no milk run. The opposition's aircraft can fire missiles at you or you may even be destroyed by the bombs as they drop. Desperate pilots may even ram your plane or plunge into your blockhouse, suicidally.

Flight personnel are sometimes forced to parachute from badly damaged aircraft. As they float helplessly to earth, they become targets for enemy missiles.

The greater the damage you deal to your enemy, the higher your score, which is constantly updated at the bottom of the display screen.

The sounds of battle, from exploding bombs to the pathetic screams from wounded parachutists, remind each micro-commander of his bounden duty. Press On, SKYBOMBERS—Press On!

Minimum system requirements: An Apple II or Apple II Plus, with 32K RAM, one disk drive and game paddles.

Order No. 0271AD (disk-based version) \$19.95



* A trademark of Apple Computer Inc.

PETERBOROUGH, N.H. 03458
603-924-7296

Instant Software™

Apple* Software

From Instant Software

Santa Paravia and Fiumaccio

Buon giorno, signore!

Welcome to the province of Santa Paravia. As your steward, I hope you will enjoy your reign here. I feel sure that you will find it, shall we say, profitable.

Perhaps I should acquaint you with our little domain. It is not a wealthy area, signore, but riches and glory are possible for one who is aware of political realities. These realities include your serfs. They constantly request more food from your grain reserves, grain that could be sold instead for gold florins. And should your justice become a trifle harsh, they will flee to other lands.

Yet another concern is the weather. If it is good, so is the harvest. But the rats may eat much of our surplus and we have had years of drought when famine threatened our population.

Certainly, the administration of a growing city-state will require tax revenues. And where better to gather such funds than the local marketplaces and mills? You may find it necessary to increase custom duties or tax the incomes of the merchants and nobles. Whatever you do, there will be far-reaching consequences... and, perhaps, an elevation of your noble title.

Your standing will surely be enhanced by building a new palace or a magnificent *cattedrale*. You will do well to increase your landholdings, if you also equip a few units of soldiers. There is, alas, no small need for soldiery here, for the unscrupulous Baron Pepone may invade you at any time.

To measure your progress, the official cartographer will draw you a *mappa*. From



it, you can see how much land you hold, how much of it is under the plow and how adequate your defenses are. We are unique in that here, the map IS the territory.

I trust that I have been of help, signore. I look forward to the day when I may address you as His Royal Highness, King of Santa Paravia. *Buona fortuna* or, as you say, "Good luck". For the Apple 48K.

Order No. 0174A \$9.95 (cassette version).

Order No. 0229AD \$19.95 (disk version).

**TO SEE YOUR LOCAL INSTANT SOFTWARE DEALER OR USE THE ORDER FORM BELOW
ORDER**

For Fast
Service
call now
Toll-Free
1-800-258-5473

Apple Cassettes

0018A Golf.....	\$7.95
0025A Mimic.....	\$7.95
0040A Bowling/Triology.....	\$7.95
0073A Math Tutor I.....	\$7.95
0079A Oil Tycoon.....	\$9.95
0080A Sahara Warriors.....	\$7.95
0088A Accounting Assistant.....	\$7.95
0094A Mortgage w/Prepayment Option/ Financier.....	\$7.95
0096A Space Wars.....	\$7.95
0098A Math Tutor II.....	\$7.95
0174A Santa Paravia and Fiumaccio.....	\$9.95
0148A Air Flight Simulation.....	\$9.95

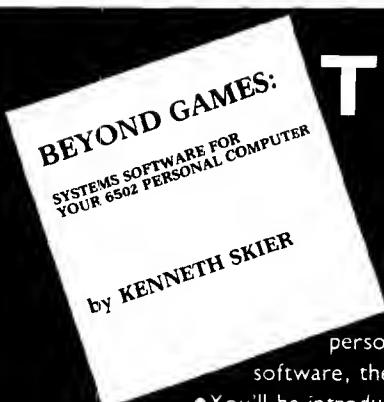
We Guarantee It!



OUR PROGRAMS ARE GUARANTEED
TO BE QUALITY PRODUCTS. IF NOT
COMPLETELY SATISFIED YOU MAY
RETURN THE PROGRAM WITHIN 60
DAYS. A CREDIT OR REPLACEMENT
WILL BE WILLINGLY GIVEN FOR
ANY REASON.

109				
Name _____				
Address _____				
City _____		State _____		Zip _____
<input type="checkbox"/> Check <input type="checkbox"/> Money Order <input type="checkbox"/> VISA <input type="checkbox"/> AMEX <input type="checkbox"/> Master Charge				
Card No. _____ Exp. Date _____				
Signed _____ Date _____				
Order your Instant Software today!				
Quantity	Order No.	Program name	Unit cost	Total cost
Shipping and handling			\$1.00	
Total order			_____	

Instant Software Inc.
Peterborough, N.H. 03458



Tired of playing games?

If you're serious about personal computing, here's the book for you: **Beyond Games: Systems Software for Your 6502 Personal Computer**.

- Written for owners of Apple, Atari, Commodore, OSI, and Panasonic Quasar personal computers, this indispensable guidebook is a self-contained course in systems software, the "other side" of your computer that lets you take advantage of its full power.
- You'll be introduced to the 6502 microprocessor and assembly language programming.
- Learn about structured programming and top-down design.
- Learn how to add an extended monitor, disassembler, text editor, and hexadecimal dump routine to your system.

Written by one of the experts in the field, **Beyond Games** is sure to become one of the most useful tools in your software library.



This and other BYTE/McGraw-Hill books are available from BYTE BOOKS or your local computer store.

ISBN 0-07-057860-5
Price \$14.95

Available in Spring

Please send copies of **Beyond Games: Systems Software for Your 6502 Personal Computer**

Name _____ Title _____ Company _____

Street _____ City _____ State/Province _____ Code _____

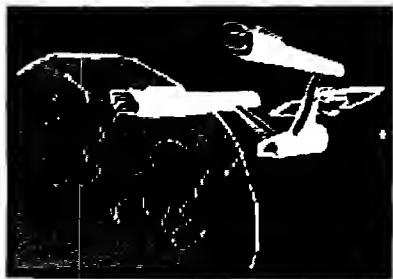
Check enclosed in the amount of \$_____
 Bill Visa Bill Master Charge
Card No. _____ Exp. Date _____
Add 75¢ per book to cover postage and handling.
Please remit in U.S. funds or draw on a U.S. Bank.

BYTE
BOOKS
70 Main St.
Peterborough, NH 03458
B221

VersaWriter & APPLE II: The Keys to Unlimited Graphics

DRAWING TABLET

Although VersaWriter operates on a simple principle, it produces graphics which match or exceed those of other digitizers. Rugged construction, translucent base, easy to use — plugs directly into APPLE II.



GRAPHICS SOFTWARE

Easily the most capable and complete graphics software for the home computer available. Fast fill drawings in 100 colors. All text in five sizes, compile and display shapes, edit, move and much more!



UNIQUE OFFER

See VersaWriter at your local dealer and pick up a copy of our demonstration disk. The complete VersaWriter hardware and software package is a real bargain at \$249. For more information call or write:

Versa Computing, Inc. • 887 Conestoga Circle • Newbury Park, CA 91320 • (805) 498-1956

"THE BEST" IS HERE! THE BEST OF MICRO — Volume 3

The most substantial MICRO articles - 320 pages organized by major microcomputers.
(Covers June through May 1980.)
Suggested Retail \$10.00 US and Canada

YOUR MICRO DEALER HAS A COMPLETE INDEX TO OUR "BEST OF" VOLUMES.

At Your MICRO Computer Dealer Now
Complete your collection—ask about 'Best of' 1 and 2

If your local computer dealer does not have an
adequate stock of this volume, you may order direct.
MICRO will pay the shipping charges (anywhere in the
world) on these orders until March 31. Write or call:

MICRO™
P.O. Box 6502
Chelmsford, MA 01824
(617) 256-5515

★
★ K A S Y T ★
★ M M M M M ★

END FRUSTRATION!!

FROM CASSETTE FAILURES

PERRY PERIPHERALS HAS

THE HDE SOLUTION

OMNIDISK SYSTEMS (5" and 8")

ACCLAIMED HDE SOFTWARE

● Assembler, Dynamic Debugging Tool,
Text Output Processor, Comprehensive

Memory Test

● Coming Soon—HDE BASIC
PERRY PERIPHERALS S-100 PACKAGE

Adds Omnidisk (5") to

Your KIM/S-100 System

● Construction Manual—No Parts

● FODS & TED Diskette

● \$20. +\$2. postage & handling. (NY residents
add 7% tax) (specify for 1 or 2 drive system)

Place your order with:
PERRY PERIPHERALS

P.O. Box 924

Miller Place, N.Y. 11764

(516) 744-6462

Your Full-Line HDE Distributor/Exporter

GALAXY SPACE WAR I

Galaxy Space War 1* (WAR1) is a game of strategy in which the player has complete control of his space fleet's tactical maneuvers. Each fleet battles its way toward the opponents galaxy in an attempt to destroy it and win the war. WAR1 simulates the actual environment encountered in a space war between two galaxies. Optimum use is made of Apple's high resolution graphics (HIRES) and colors in displaying the twinkling stars universe, the colored ships of each fleet, long range sensors colored illuminations, and the alternating blinking colors used in battles between ships. Complementing HIRES are the sounds of war produced by Apple's speaker.

WAR1 is played between Apple and a player or between two players. You may play with total knowledge of each other's fleet or only ships sensor knowledge of the opponents fleet. Each player builds his starting fleet and adds to it during the game. This building process consists of creating the size and shape of each ship, positioning it, and then allocating the total amount of energy for each ship.

During a player's turn he may dynamically allocate his ship's total energy between his screen/detection and attack/move partitions. The percentage of the total energy allocated to each partition determines its characteristics. The screen/detection partition determines how much energy is in a ship's screens and the detection sector range of its short range sensors. The attack/move determines the amount of energy the ship can attack with, its attack sector range, and the number of sectors it can move in normal or hyperspace.

When an enemy ship is detected by short range sensors, it is displayed on the universe and a text enemy report appears. The report identifies the ship, its position, amount of energy in its screens, probable attack and total energy, a calculated detection/attack/move range, and size of the ship. Also shown is the number of days since you last knew these parameters about the ship. When a ship's long range sensor probes indicate the existence of an enemy presence at a sector in space, this sector is illuminated on the universe.

An enemy ship is attacked and destroyed with attack energy. If your attack energy breaks through his screens, then his attack energy is reduced by two units of energy for every unit you attack with. A text battle report is output after each attack. The program maintains your ship's data and the latest known data about each enemy ship. You may show either data in text reports or display the last known enemy positions on the universe. You can also get battle predictions between opposing ships. The text output calculates the amount of energy required to destroy each ship for different energy allocations.

APPLE® II, 48K, APPLESOFT

ROM CARD, DISK II 005 3.2

WAR1 DISK & MANUAL ...\$39.95

(CA residents add 6% sales tax)

Write or call for more information

 GALAXY

OEPT. MI5

P.O. BOX 22072

SAN DIEGO, CA 92122

(714) 452-1072

*Software Reviews: Apple Orchard (12/80); The Book (1/81); Creative Computing (3/81)

OHIO SCIENTIFIC USERS

SOFTWARE — GAME AND UTILITY PROGRAMS FOR AS LOW AS \$1.00. ALL
WITH LISTINGS AND COMPLETE DOCUMENTATION.

KITS — UPDATE YOUR COMPUTER TO PLAY MUSIC, INCREASE OPERATING
SPEED, HIGH RESOLUTION GRAPHICS AND MUCH MORE. KITS INCLUDE
PARTS AND COMPLETE ASSEMBLY INSTRUCTIONS. LOW AS \$3.00.

OUR \$1.00 CATALOG INCLUDES OSI PROGRAMMING TIPS PLUS DESCRIPTIONS
OF AVAILABLE PROGRAMS AND KITS.

ME
MO 1
10
EN

MITTENDORF ENGINEERING 905 VILLA NUEVA DR. LITCHFIELD PARK, AZ 85340

MICRO Classified

Programmer Fatigue?

SYM—BUG/MONEX adds 15 commands to SYM's repertoire including an interactive trace/debug. Cassette @ \$0200 or \$3800: \$19.95. EPROM (2716-5v) @ \$F000-\$F7FF: \$39.95. Commented source listing: \$9.95. RAE-1(2) FORMAT CASSETTE: \$35 (requires 8K). Custom assembly add \$2.00. Foreign add \$2.00. SASE for more information.

Jeff Holtzman
6820 Delmar-203
St. Louis, Missouri 63130

PET Machine Language Guide

Comprehensive manual to aid machine language programmer. More than 30 routines are fully detailed so that the reader can put them to immediate use. OLD or NEW ROMS. \$6.95 + .75 postage. VISA & Mastercharge accepted.

Abacus Software
P.O. Box 7211
Grand Rapids, Michigan 49510

OHIO SCIENTIFIC

Animated Moon Lander game for C1 and C4. View a series of high resolution looking lunar vistas as you descend from 120 miles. Accurate instrument readings. A cartoon landing sequence rewards your successful landing. See what OSI graphics can do! Other programs available. \$9.95 cassette 8K, \$12.45 disk 24K.

Earthship
P.O. Box 489
Sussex, New Jersey 07461

OHIO SCIENTIFIC

Catchword, a multi-player, competitive word game uses the computer to generate letters and point values. Letters are up for grabs by any player. The idea is to make as many words as possible in crossword form on your board. The computer recognizes and penalizes you for all sorts of sloppy playing. C1 and C4. \$9.95 cassette 8K; \$12.45 disk 24K. Other programs available.

Earthship
P.O. Box 489
Sussex, New Jersey 07461

AIM-65 High Quality Power Supply

Designed to Rockwell's specifications. Overvoltage protection, fuse, switch, pilot light, line cord, cable — all included. Handsome all metal case. Satisfaction or return unit within 10 days for full refund. VISA/MC. Check (2 weeks to clear). \$64.95 plus shipping (5 lbs).

CompuTech,
Box 20054
Riverside, California 92516

Spanish Hangman

2,000 SPANISH words and sentences taught in a fun way on the Apple. Send for your school's free 30-day evaluation diskette, from:

George Earl
1302 South General McMullen
San Antonio, Texas 78237

APPLE Banner Printer Program

Prints banners with any message up to 70 characters with large letters, which are 70 columns high. Machine language. DOS 3.2 disk or cassette \$8.00, or send .30 in stamps for sample printout and more information.

Philip Bryan
529 West Street
Park City, Illinois 60085

Turnkey Medical Billing System

Interactive data entry. Automated record management. Outputs: Patient statements, Universal Claim Forms, financial reports. Customized by user-developed text files. Requires Apple, Applesoft, printer. One disk drive manages 200 accounts; 2 drives — 500 accounts. \$350 for programs and 17+ pp documentation.

Jerome B. Blumenthal, M.D.
7500 E. Hellman
Rosemead, California 91770

Atari - Pet Owners

KINETIC DESIGNS has software for you! Games and Simulations, Music, Astronomy, Ham Radio, home use, utility, and many others. MTU Visible Memory and music programs now available! Prices start at only \$2.50! (Atari \$3.50) Guaranteed! Send SASE for full details.

Kinetic Designs
401 Monument Road #171
Jacksonville, Florida 32211

AIM/KIM/SYM

NBS Computing gives you time! A battery backed-up clock-calendar board that runs on the application bus. The clock will run for months without power and can generate interrupts on SYM systems. \$69.95 assembled, \$34.95 bare board. Both include drivers.

NBS Computing
1674 E. M-36
Pinckney, Michigan 48169

Save Money — You Can!

By building your own computer interfaces. 80% savings. Send \$3.95 for simple how-to package today.

ADS
Box 9770
Jacksonville, Florida 32208

Send for FREE
Control Page
Also Available soon on Atari

EDIT 6502

T.M. LJK

Two Pass Assembler, Disassembler, and Editor Single Load Program DOS 3.3., 40/80 Columns, for Apple II or Apple II Plus*

A MUST FOR THE MACHINE LANGUAGE PROGRAMMER. Edit 6502* is a two pass Assembler, Disassembler and text editor for the Apple computer. It is a single load program that only occupies 7K of memory. You can move freely between assembling and disassembling. Editing is both character and line orientated, the two pass disassemblies create editable source files. The program is so written so as to encompass combined disassemblies of 6502 Code, ASCII text, hex data and Sweet 16 code. Edit 6502 makes the user feel he has never left the environment of BASIC. It encompasses a large number of pseudo opcodes, allows linked assemblies, software stacking (single and multiple page) and complete control of printer (paganation and tab setting). User is free to move source, object and symbol table anywhere in memory. Requirements: 48K of RAM, and ONE DISK DRIVE. Optional use of 80 column M&R board, or lower case available with Paymar Lower Case Generator.

TAKE A LOOK AT JUST SOME OF THE EDITING COMMAND FEATURES. Insert at line # n Delete a character Insert a character Delete a line # n List line # n1, n2 to line # n3 Change line # n1 to n2 "string" Search line # n1 to n2 "string".

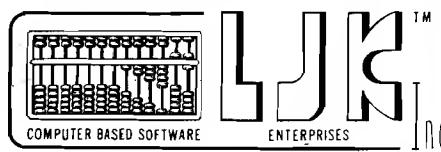
LJK Enterprises Inc. P.O. Box 10827 St. Louis, MO 63129 (314) 846-2313

*Edit 6502 T.M. of LJK Ent. Inc. — Apple T.M. of Apple Computer Inc.

LOOK AT THESE KEY BOARD FUNCTIONS: Copy to the end of line and exit. Go to the beginning of the line: abort operation: delete a character at cursor location: go to end of line: find character after cursor location: non destructive backspace: insert a character at cursor location: shift lock: shift release: forward copy: delete line number: prefix special print characters. Complete cursor control: home and clear, right, left down up. Scroll a line at a time. Never type a line number again.

All this and much much more — Send for FREE information.

Introductory Price \$50.00.



PET String Flip

This routine solves the problem of upper and lower case inversion when using CBM 2022 and 2023 printers with OLD ROM PETs. The method is to invert the characters in the string area of RAM.

James Strasma
120 West King Street
Decatur, Illinois 62521

PET owners with old ROMs (2.0) and a Commodore CBM 2022 or 2023 printer have a problem. The printers do a fine job with lowercase and uppercase printing. However, what appears on the screen as uppercase comes out on the printer in lowercase, and vice versa. This is due to the non-standard ASCII codes used by the old ROM PET. Some new ROM PET owners may have the same problem, if they use a printer interface that was designed to correct the output of an old ROM PET.

According to Commodore's *PET Users Club Newsletter* (issue #9), the recommended solution for this problem is to order upgrade ROMs (3.0). This is a good solution. It gives the user a monitor in ROM, and access to the non-maskable interrupt (for a warm start after a "crash"). However, it costs close to a hundred dollars to upgrade. Also, many PET owners are fiercely loyal to their old ROMs, and would rather fight than switch. For those owners, and for those with new ROMs and a printer interface designed for old ROMs, STRING FLIP offers another solution.

STRING FLIP OLD ROM PET'S WITH CBM PRINTERS

036C	BTMSTR	*	\$0082	BOTTOM OF STRING SPACE (\$0030 WITH 3.0 ROM'S)
036C	HIMEM	*	\$0086	TOP OF RAM MEMORY (\$0034 WITH 3.0 ROM'S)
036C	POINTR	*	\$0001	INDIRECT POINTER
033A	ORG \$033A SECOND CASSETTE BUFFER			
033A A0 00	LDY	#\$00	CLEAR INDEX	
033C A5 82	LDA	BTMSTR	COPY BOTTOM OF	
033E 85 01	STA	POINTR	STRINGS ADDRESS	
0340 A5 83	LDA	BTMSTR	+01 INTO POINTER	
0342 85 02	STA	POINTR	+01 LOCATION.	
0344 A5 02	DONE	LDA	POINTR	+01 CHECK WHETHER
0346 C5 87		CMP	HIMEM	+01 THE POINTER HAS
0348 30 07		BMI	NOTDON	REACHED THE
034A A5 01		LDA	POINTR	TOP OF RAM
034C C5 86		CMP	HIMEM	MEMORY YET.
034E D0 01		BNE	NOTDON	IF SO,
0350 60		RTS		RETURN TO BASIC.
0351 B1 01	NOTDON	LDA	(POINTR),Y LOOK AT THE	
0353 AA		TAX	NEXT STRING CHARACTER.	
0354 29 7F		AND	#\$7F	IGNORE ITS CASE FOR NOW.
0356 C9 41		CMP	#\$41	IS IT A LETTER?
0358 90 09		BCC	UPPNTR	
035A C9 5B		CMP	#\$5B	IF NOT,
035C B0 05		BCS	UPPNTR	DON'T CHANGE IT.
035E 8A		TXA		REMEMBER THE CASE.
035F 49 80		EOR	#\$80	FLIP CASE, & PUT BYTE
0361 91 01		STA	(POINTR),Y BACK IN STRING AREA.	
0363 E6 01	UPPNTR	INC	POINTR	UP THE POINTER
0365 D0 DD		BNE	DONE	& LOOP BACK.
0367 E6 02		INC	POINTR	+01
0369 D0 D9		BNE	DONE	
036B 00		BRK	CAN'T GET HERE!	

This is a short program, just 50 bytes long. It is entirely relocatable. It inverts the bit of each byte that indicates uppercase or lowercase. It does this throughout the part of memory known to hold string data. However, it only changes those values within the range of the alphabet. This allows the user to invert most data before sending it to the printer. After printing, the routine may be called again to flip the data back to the normal screen form.

I use STRING FLIP this way: load STRING FLIP, alone or within a program as data; define a variable, flip, to remember we've flipped; before each printer routine, have a line such as

```
300IF FLIP < 1 THEN SYS(826):  
  FLIP = 1:REM  INVERT  
  CASE
```

Then on return to screen mode, have a similar line:

```
100IF FLIP > 0 THEN SYS(826):  
  FLIP = 0:REM  NORMAL  
  CASE
```

This routine should correct most of your printouts. If you find a string that still prints incorrectly, most likely it is defined within the BASIC program, rather than in the string area. You can correct this by redefining it, as in this example:

```
200a$ = "Sorry, Try Again"  
  :a$ = a$ + " "
```

Enjoy STRING FLIP in all your word-processing and data-handling programs.

Jim Strasma is an associate pastor at a large United Methodist Church in central Illinois. He developed an interest in personal computers when he accidentally wandered into one of the very first computer stores in New York City, in January 1977. Currently, he is developing church-related software. He is also organizing a users group for persons with any of the assemblers by Carl Moser. MICRO readers interested in either effort are welcome to contact him.

MICRO

FINANCIAL MANAGEMENT SYSTEM II

A FAST, EASY-TO-USE ACCOUNTING SYSTEM

DESIGNED FOR
HOME AND BUSINESS ACCOUNTING

OBJECTIVE: Enter an entire month's checking, charge card, and cash accounts in just a few minutes using your own personalized macro lists. Instant error correction on all entries. Audit all files by Code and month. **PERFECT FOR TAX ACCOUNTING.** Powerful new **BUDGET MANAGER** for planning and comparing budget with audits. Printer routines for listing disk files, balance, reconcile, search, macro lists, audit and budget reports.

ALL THE ORIGINAL FEATURES + NEW BUDGET MANAGER

- * 1-3 KEYSTROKE ENTRYS
- * AUTOMATIC TAX CODING
- * SINGLE OR DUAL DISK DRIVE

★ **ACCOUNT MANAGER:** A self-prompting, error avoiding entry system which includes disk files, balance, reconcile, edit, and sort.

★ **BUDGET MANAGER:** Plan, review, and balance your budget. Then generate complete reports with summation for any 1 - 12 month period.

★ **SYSTEM UTILITY:** Enter your own item and tax Code Macros, up to 100 each. Configure program to match almost any printer/disk system.

★ **SEARCH RECORDS:** Search for any given data. Make specific and expanded searches using the Macro lists.

★ **ACCOUNT AUDITOR:** Totals all files by tax Code and any 1-12 month period with year-to-date totals.

★ **48K APPLE with ROM APPLESOFT and disk required (printer optional)**

PRICE: \$39.95 -- Check, VISA, or MASTER CHARGE accepted.

D R JARVIS COMPUTING

1039 Caditz Dr. - SImi, CA 93065

Phone (805) 526-0151

Dealer Inquiries Invited

Get Paid for Your Software!

Established publisher looking for
new and interesting business and
communication oriented applica-
tions for Apple computers.
No games.

Send Info to:
M.G. Hill
54 Ridge Avenue
Newton Center, MA 02159

JINSAM

DATA MANAGER

SAVE TIME. SAVE MONEY.
Let JINSAM work for you.

- ★ CUSTOM DATA FILES
- ★ CUSTOM REPORTS/LABELS
- ★ KEYED RANDOM ACCESS
- ★ FAST/EASY/MENU DRIVEN
- ★ MULTIPLE SEARCH KEYS
- ★ PRIVACY ACCESS CODES
- ★ WILD CARD SEARCH

JINSAM data manager assists you by intellectually manipulating records.

No more will hundreds of valuable hours be spent searching for needed information. No more will hundreds of hours be spent entering and re-entering information for various reports.

With JINSAM you can truly transform your Commodore Computer into the "state of the art" data processing machine with sophisticated features and accessories found nowhere, even at 10 times the price.

There are three disk based JINSAM. JINSAM 1.0 allows fast and easy file handling, manipulation and report generation. JINSAM 4.0 was designed for the professional and contains features needed in the business environment, such as: JINSORT, a user accessible machine language sort; compaction/expansion of databases, merging databases and much much more. JINSAM 8.0 is our best. JINSAM 8.0 runs on the new Commodore 8032, 80 column display computer. JINSAM 8.0 has all the functions of 4.0 plus additional features found only on the most sophisticated and expensive database management systems.

JINSAM is a new breed of data processing software. Powerful, sophisticated and easy to use. JINSAM has been thoroughly field tested. JINSAM is now installed and saving its users valuable time and money in educational institutions, research institutions and offices nationwide.

JINSAM was designed with the user in mind. It is a forgiving system with help commands, prompts and utilities for recovering the bulk of data even after power failure, security passwords for privacy, editing, reclaiming space, auto recall, restructuring, unlimited report formats, label printing and a choice of accessory modules all accomplished by a few keystrokes.

JINSAM has 5 accessory interfacing modules: WORDPROPACK - Intelligent interface for WORDPRO 3 or WORDPRO 4 which creates variable block with data or up to 10 conditions based on database contents. Produce "dunning letters", form letters, report to parent, checks, invoices, etc.

MULTI-LABEL - Prints multiple labels per record with up to 2 lines for messages and consecutive numbering. Produce inventory, bulk mail labels, etc.

MATHPACK - global +, -, x, ÷, by another field or a constant, or zero a field. Sum fields in each record or running sum of single field in all records. Extract information or effect permanent change. Replace in same field or place in a waiting field.

DESCRIPTIVE STATPACK - Determine mean, median, mode, standard deviation, variance, range. Generate histogram and produces Z-Score report.

ADVANCED STATPACK - (you must also acquire DESCRIPTIVE STATPACK). Generates CROSSTABS (number of occurrences); CHI SQUARE, LINEAR REGRESSION with graphic representation and prediction. LINEAR CORRELATION and SIMPLE ANALYSIS OF VARIANCE.

All JINSAM accessories are accessed thru the JINSAM menu and require a security password to gain entrance.

JINSAM gives the user FREEDOM OF CHOICE. Start with JINSAM 1.0 and upgrade at any time. Choose from the accessory modules available at any time. JINSAM Newsletter brings the latest updates, user input and keeps an eye on the future.

JINSAM alone is reason enough to own a computer. JINSAM can be found at Commodore dealers. Write for the dealer nearest you.

The many features of JINSAM 1.0 - 8.0

JINSAM 1.0 for 16K/32K CBM 2001. Requires CBM 2040 or COMPU/THINK disk - including oldest ROMs. Menu Driven, ISAM - Indexed Sequential access method • Encrypted PASS WORDS for privacy • Unlimited fields • unlimited search criteria • 3 deep subsorts • .5 - 3 sec retrieval • editing • Auto Recall • Wild Card Capabilities; Reports: multiple headings • paging • page numbering • item count. Labels: any size • 1-5 across • sheet or continuous. Utilities: Help commands • Recover • Key Dump • Record Dump • Descriptor Dump • Restructure.

JINSAM 4.0 for 32K CBM 2001 with BASIC 4.0. Requires CBM 2040 with DOS 2.1. Has most Dealer inquiry welcome

"JINSAM is the best Database Management System for the Commodore Computers!"

of JINSAM 1.0 functions Plus + machine sort with user access instructions • sort 1000 records in apx 10 secs • Global Compaction/Expansion • Create new database from existing database • merge databases. Includes MULTI-LABEL • 4 deep subsorts. (Available Jan. 13, 1981)

JINSAM 8.0 for Model 8032 with 80 Column screen. Requires 2040 or 8050 disk. Commercial Disk version for 80 Columns, JINSAM 4.0 functions Plus + Displays report formats to screen, 4 deep subsorts. (Available Jan. 1, 1981)

JINSAM is a trademark of JINI MICRO-SYSTEMS, Inc.
WordPro is a trademark of Professional Software Inc.
CBM is a trademark of Commodore Business Machines.

JINSAM Data Manager for Commodore Computers

— Additional Information

— Jinsam Demo Disk (\$10, plus tax)

— Users Guide 1.0 (\$25 plus tax)

Please send to:

Name _____

Position _____

Company _____

Address _____

City, State, Zip _____

Phone () _____

Computer, Disk _____

JINI MICRO SYSTEMS, INC.

Box 274 • Riverdale, NY 10463

MICRO

PET Vet

By Loren Wright

First, I would like to revive the "Panic Button" routine by Michael Riley (*PET User Notes*, Vol. I, #7). On the OLD PET, it allows you to recover from a crash without losing memory. Since it is a machine language routine that has to be loaded in, it is certainly less convenient than pressing a reset button. However, we all know that PETs don't have reset buttons. 2.0 ROM PETs can't even support them. Operation is simple. Load the program in, and initialize with SYS 826. Now run your suspect program—BASIC or machine language. If it crashes, just press the RUN/STOP and RVS/OFF keys together and you're alive again. Before running again, the Panic feature must be reinitialized with SYS 826. While initialized, normal cassette operation is not possible, so be sure to deactivate the "Panic Button" by pressing the two keys, before attempting any cassette maneuvers.

Briefly, the way it works is to divert the program flow to a routine that checks for the two keys. Even when the PET is crashed, it must pass through the hardware interrupt vector at \$0219,\$021A. When the keys are pressed, the vector is restored to its original condition. You probably wouldn't want to load this in every time you want to play a game, but it could save a lot of frustration during program development.

033A 78	INIT	SEI
033B A9 47		LDA #\$47
033D 8D 19 02		STA \$0219
0340 A9 03		LDA #\$03
0342 8D 1A 02		STA \$021A
0345 58		CLI
0346 60		RTS
0347 A9 F9	PANIC	LDA #\$F9
0349 8D 10 E8		STA \$E810
034C AD 12 E8		LDA \$E812
034F C9 EE		CMP #\$EE
0351 F0 03		BEQ RSTORE
0353 4C 85 E6		JMP \$E685
0356 A9 85	RSTORE	LDA #\$85
0358 8D 19 02		STA \$0219
035B A9 E6		LDA #\$E6
035D 8D 1A 02		STA \$021A
0360 6C 1B 02		JMP (\$021B)

3.0 and 4.0 ROM PETs can support a two-button reset device that will restore control without losing RAM

contents. To implement a warm reset, pin 5 of the parallel user port must first be grounded. Then the reset line [Memory Expansion J4—pin 22] is momentarily grounded, and pin 5 of the user port can now be released. This will put you in the monitor. You must first exit the monitor, and then re-enter it, to restore normal operation. One commercial unit available is the Uncrasher from International Technical Systems (Woodbridge, Virginia, \$14.95). Also, the new 1st MATE memory expansion board from The Computerist (Chelmsford, Massachusetts) supports this feature with switches and debouncing circuitry. Others are sold by Gord Reithmeyer in Canada and Qwerty Computer Services in Great Britain.

Avoid Accidental INPUT Exit

This is one easy way to prevent exiting an INPUT statement with an accidental RETURN. My favorite character to use for this is a shifted '?' (ASCII 191), but any can be used.

```
10 INPUT "crcrcr■clclcl";X$  
20 IFX$="■"THEN10
```

An escape is still possible by moving the cursor off the INPUT line and hitting return, but this is more difficult to do accidentally.

Commodore's Computer Shows

Commodore's own computer show in Philadelphia [November 13 and 14, 1980] was attended by more than 16,000 people. Commodore literally brought a truckload of computers, so that all of the exhibitors had the equipment they needed. In addition there were many computers available to the public for trying out programs and playing games. Based on the success of this show, Commodore will take the show to Boston, February 7-8, 1981, at the Boston Sheraton. The next location is New York, probably by the end of February.

Publications

In contrast to the U.S., Commodore occupies the dominant position in Europe in the personal computer market. As a result, there are many Commodore-oriented companies producing good software and hardware. *Printout Magazine* is a 48-page publication covering the PET and CBM

exclusively. A sample issue can be had for \$3.00 postpaid, or a subscription for \$36.00.

Printout Magazine
P.O. Box 48
Newbury RG16 OBD
Berkshire, Great Britain

The Central Illinois PET Users has established a free publication called *The Midnight Software Gazette*, to fill the need for short, timely reviews of hardware and software products for the PET. Send a self-addressed, stamped envelope [2 oz.—\$.28 U.S. and Canada] for the current issue. When you get it, be sure to make copies and distribute them to your friends!

Central IL PET Users
c/o Jim Strasma
3838 Benton Drive
Decatur, Illinois 62526

To Authors and Would-be Authors

MICRO has still not been overwhelmed by PET manuscripts, so it is time to point this out to any hesitant authors. Articles do not need to be on the most advanced topics. Good treatment of an elementary subject is as good, or better. Articles describing a particular computer application, in business, industry, home, education, and others, are encouraged. Also, remember, there is room on the PET Vet page for your short items, and for me to answer your questions.

One of my continuing objectives is to make all PET programs published in MICRO usable by owners of all three sets of BASIC ROMs. Authors can help by keeping this in mind when submitting manuscripts. In some cases, this means writing the program a little differently, so it will run on all machines. In other cases, it will mean providing a separate list of the alternate page zero and PET subroutine addresses.

Programs that can run on more than one manufacturer's computer are especially sought by MICRO, but it is not enough to say your program can be easily modified—include the modifications!

Another way authors can help is by submitting tapes or diskettes with manuscripts. This not only aids in testing and evaluation of programs, but in most cases, allows us to produce letter-quality listings directly from our PETs, without adding the time-consuming and error-prone procedure of keying programs in by hand.



APPLE DISK COPY

COPIES THE "UNCOPYABLE"

Not just another disk copy program, The Locksmith makes a **BIT** by **BIT** copy of your disk. Duplication of just about any disk is possible with this program including "uncopyable" protected disks.

ENVIRONMENTALLY SAFE

The Locksmith works under DOS 3.2 or 3.3 in either 13 or 16 sector environments and is compatible with disks created under Basic, Pascal, Fortran, & other languages. Requirements are an **APPLE II** or **APPLE II+** with **EITHER** one or two drives.

RELAX

No longer do you have to worry about spills, staples, or magnetic fields that destroy your valuable diskettes. The Locksmith allows you to make backups of your most valuable disks.

PAYS FOR ITSELF

Time lost getting replacements of ruined disks, as well as avoiding outrageous charges for this service, will pay for The Locksmith in a short time.

REPLACEMENT POLICY

The Locksmith uses an advanced bit copy technique which is insensitive to currently used disk protection methods. The Locksmith will copy virtually **ANY** diskette with one notable exception; **ITSELF**. Although we ship all disks with copies of the program on **BOTH** sides, we realize that accidents happen. Therefore, we offer a simple, no nonsense replacement policy. If you fold, staple, or mutilate your copy of The Locksmith (or otherwise render your disk unusable), just return the original and \$3.00 (for postage, packing, and handling) for a prompt replacement.

ORDER TOLL FREE

Mastercharge and Visa users call 1-800-835-2246 Toll Free anytime. Kansas residents call 1-800-362-2421. Or send \$74.95. Florida residents add \$3.00 sales tax.

OMEGA SOFTWARE SYSTEMS, INC
1574 Ives Dairy Rd.
No. Miami, Fla. 33179

© Omega Software Systems

APPLE is a registered trademark of Apple Computer, Inc.

Dealer inquires invited.

J-6502-A

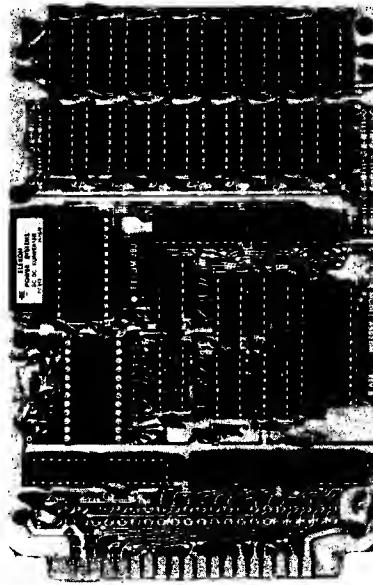
32 K BYTE MEMORY
RELIABLE AND COST EFFECTIVE RAM FOR
6502 & 6800 BASED MICROCOMPUTERS
AIM 65-*KIM*SYM
PET*S44-BUS

- * PLUG COMPATIBLE WITH THE AIM-65/SYM EXPANSION CONNECTOR BY USING A RIGHT ANGLE CONNECTOR (SUPPLIED) MOUNTED ON THE BACK OF THE MEMORY BOARD.
- * MEMORY BOARD EDGE CONNECTOR PLUGS INTO THE 6800 S 44 BUS.
- * CONNECTS TO PET DR KIM USING AN ADAPTOR CABLE.
- * RELIABLE—DYNAMIC RAM WITH ON BOARD INVISIBLE REFRESH—LOOKS LIKE STATIC MEMORY BUT AT LOWER COST AND A FRACTION OF THE POWER REQUIRED FOR STATIC BOARDS.
- * USES +5V ONLY, SUPPLIED FROM HOST COMPUTER.
- * FULL DOCUMENTATION, ASSEMBLED AND TESTED BOARDS ARE GUARANTEED FOR ONE YEAR AND PURCHASE PRICE IS FULLY REFUNDABLE IF BOARD IS RETURNED UNDAMAGED WITHIN 14 DAYS.

ASSEMBLED WITH 32K RAM	\$395.00
& WITH 16K RAM	\$399.00
TESTED, WITHOUT RAM CHIPS	\$279.00
HARD TO GET PARTS (NO RAM CHIPS)	
WITH BOARD AND MANUAL	\$109.00
BARE BOARD & MANUAL	\$49.00

PET INTERFACE BOARD CONNECTS THE 32K RAM BOARD TO A 16 OR 32 K PET COMPUTER. INTERFACE CARDBOARD, STANDOFFS, POWER SUPPLY MODIFICATION KIT, AND COMPLETE INSTRUCTIONS \$49.00

U.S. PRICES ONLY



16K MEMORY EXPANSION KIT

ONLY **\$58**

FOR **APPLE**, **TRS-80** KEYBOARD, **EXIDY**, AND ALL OTHER 16K DYNAMIC SYSTEMS USING **JK4116-3** OR EQUIVALENT DEVICES.

- * 200 NSEC ACCESS, 375 NSEC CYCLE
- * BURNED-IN AND FULLY TESTED
- * 1 YR. PARTS REPLACEMENT GUARANTEE
- * QTY. DISCOUNTS AVAILABLE

ALL ASSEMBLED BOARDS AND MEMORY CHIPS CARRY A FULL ONE YEAR REPLACEMENT WARRANTY

BETA COMPUTER SYSTEMS

1230 W. COLLINS AVE.
ORANGE, CA 92668
(714) 633-7280

Call or write for info. Please add 6% sales tax. Mastercharge & Visa accepted. Please allow 14 days for checks to clear. Bank Phone orders welcome. Shipping charges will be added to all shipments.

BASIC THAT SCREEMS

Is the sedate pace of your OSI BASIC taking the fun out of your programming?

Then turn your system on to FBASIC.

Now you can compile your programs with FBASIC and take full advantage of your computers potential.

FBASIC is fast. Not just 5 or 10 times as fast as OSI BASIC. FBASIC is OVER ONE-HUNDRED TIMES FASTER! Allowing you to do unheard of things in BASIC. Things that used to require assembly-language. With no need to learn a new language.

The secret to this incredible speed is that FBASIC produces native 6502 machine code. With no run-time interpreter to get in the way of all-out machine performance.

FBASIC is good for any application from wordprocessors to video games. Whatever tickles your fancy. FBASIC accepts standard BASIC source files, and produces executable disk-based object files. It includes many of the features you have always wanted: hex constants, convenient machine language calls, optional user selection of array locations, and more.

As an example of its power and performance; FBASIC was first written in OSI BASIC, which took 6 hours to compile itself. With many features added since then, it now compiles itself in a little over 4 minutes!

So let that pent-up performance out. Find out what your machine is really capable of. Feed it some FBASIC and stand back!

FBASIC runs under OS-65D and requires 48K.

Available on 8" diskette for \$150.

Please include \$5 for shipping & handling.

PEGASUS SOFTWARE

P.O. Box 10014, Dept. M-2,
Honolulu, Hawaii 96816

SPECIAL INTRODUCTORY OFFER

Programmable Character Generator Board \$89.95

You can use OSI's characters or you can make your own. Imagine you can now do true high resolution graphics 512 x 256 dots in the 64 x 32 screen format. And all under your control!

Other mods available — send for catalog.

SOFTWARE (with Documentation)

PC Chess V1.9 \$14.95

Play Chess against your computer!

Helicopter Pilot: (64 CHR Video Only) \$ 8.95

An Excellent Graphics Program!

Golf Challenger \$14.95

From 1 to 4 players. Play a round of golf on your 18 hole golf course. One of the best programs I have ever seen! You can even design your own course. Comes with full documentation (14 pages).

Two Very Intricate Simulations!

Wild Weasel II: You operate a Sam Missile base during a Nuclear War. Not as easy as you think! You must operate in a three dimensional environment.

Fallsafe II: The shoe is on the other foot! Here you are in the attacking bomber and you must penetrate deep into enemy territory. Can you survive? An extremely complex electronic warfare simulation! SPECIAL: both for 19.95

VISA

MASTER CHARGE

OHIO SCIENTIFIC

THE ALL NEW
SERIES 2 COMPUTERS
ARE ON DISPLAY

WE STOCK THE COMPLETE
LINE OF AARDVARK

FOR SAN FRANCISCO AREA
READERS WE HAVE A
USERS GROUP MEETING THE
FIRST SUNDAY OF EVERY MONTH

SEND \$1.00 FOR CATALOGS

SUNSET ELECTRONICS
2254 TARAVAL ST.
SAN FRANCISCO, CA 94116
(415) 665-8330
OPEN 7 DAYS

Hardware: C1P Video Mod: Makes your 600 Video every bit as good as the 4P and 8P. Gives 32/64 CHR/Line with guardbands 1 and 2 Mhz. CPU clock with 300, 600 and 1200 baud for Serial Port. Complete Plans \$19.95

KIT(Hardware and Software) \$39.95

Installed: 32CHR — \$79.95, 64CHR-\$89.95

Extra K of Video RAM for 64CHR not included!
Set of 3 ROMs available \$75.00

C1P Sound Effects Board: Completely programmable! For the discriminating hobbyist, the best board on the market for creating sound and music. Can be interrupt driven so that you can use it for gaming purposes. Has on board audio amp, 16 bit interval timer, 128 Bytes of RAM and two 8 bit parallel I/O Ports.

Assembled and tested \$89.95 Bare Board \$39.95
Both include Prog. Manual and Sample Software.

C1P HI Speed Cassette Kit: Gives a reliable 300, 600, and 1200 Baud. No symmetry adjustments — the ideal fix for OSI's cassette interface. Easily implemented in 30 minutes. Will save you time and money even the first night you use it! \$12.95

Many, many more. Send for Catalog with free program (Hard Copy) and BASIC Memory Map. \$1.00. Two locations to serve you:

Progressive Computing
3336 Avondale Court, Windsor, Ontario
Canada, N9E 1X6
(519) 969-2500
or

3281 Countryside Circle, Pontiac TWP, MI 48057
(313) 373-0468

A C1P Sound Idea

This hardware addition creates a bell tone for the C1P or Superboard II.

David A. Ell
19926 N.E. Halsey
Portland, Oregon 97230

Ohio Scientific Superboard II and C1P users, does the idea of a bell tone to keep you company while you are programming your C1P or Superboard appeal to you? I have found the bell tone to be quite useful while I am programming. It sounds when I have a line feed or a return on my video, therefore I don't need to look at the screen to see if I have hit my return key. The tone also sounds when I am loading to, or listing from, my cassette, giving me time to relax or do something else, while the machine does its own monitoring. When the tone stops sounding I know the program is loaded or listed, whichever the case may be.

The time it takes to install this bell tone to your C1P or Superboard is very minimal and is quite inexpensive. Here is what you will need:

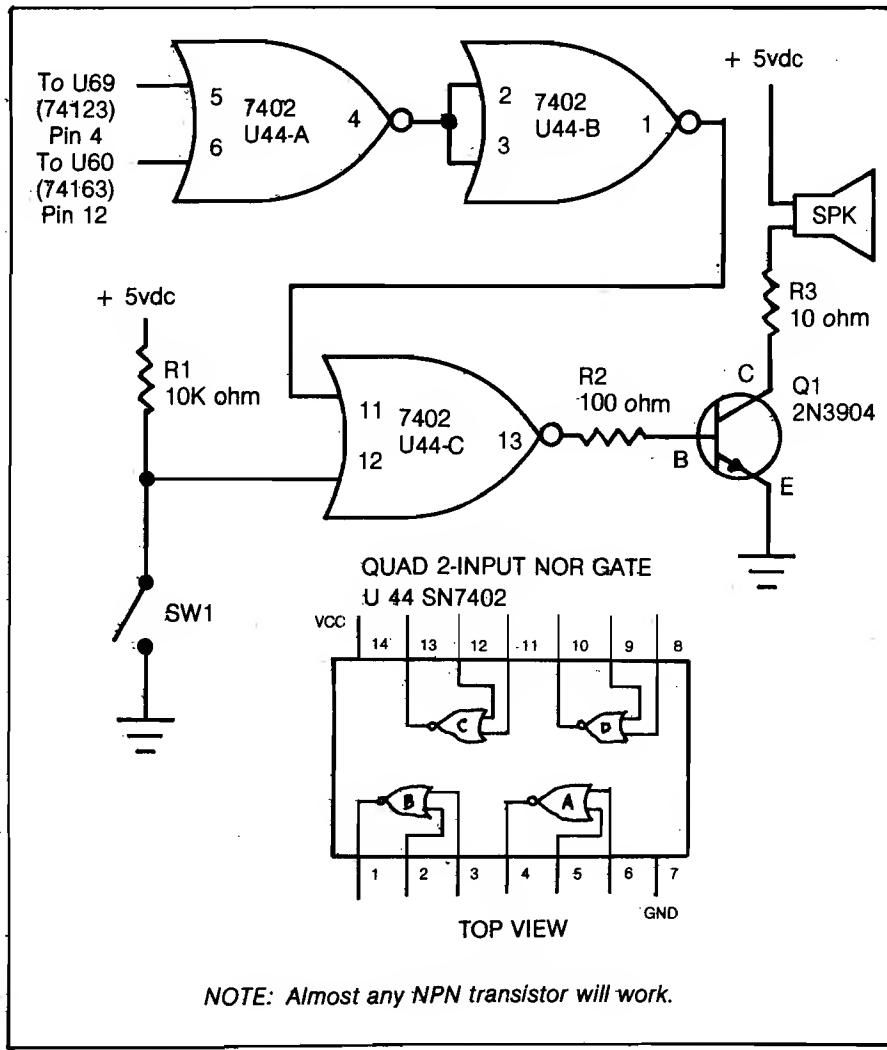
1 - 14 pin IC socket (optional)
1 - 7402 IC
1 - 3904 NPN transistor
1 - small speaker
1 - 100 ohm resistor
1 - 10 ohm resistor
1 - 10K resistor
A soldering iron, solder, and some hook-up wire.

The 7402 IC should, if possible, be a regular TTL gate, since lower-powered gates don't have as much drive power. You will need the higher drive power, because gate C of the 7402 is used to drive a 3904 NPN transistor, which is used as an audio output transistor.

One input on gate A of the 7402, a two input NOR gate, is connected to the systems clock at U60, pin 12. The second input of gate A is connected to a one shot in the video system, at U69, pin 4, which holds it high. The high at this input keeps the output low. When you receive a video line feed or return, the one shot goes low momentarily, putting the clock divider frequency from U60, on the output, then going high again ending tone.

Gate B is used as a buffer, to eliminate unwanted noise. Both inputs of gate B are tied together to the output of gate A.

Gate C is used to re-invert the output of gate B and can also be used to switch the audio tone off when it is unwanted. One input of gate C is connected to the output of gate B. The second input is pulled high through a 10K resistor. Pulling this input low, through a switch, turns on the audio tone.



APPLE II
SOFTWARE FROM
POWERSOFT

P. O. BOX 157

PITMAN, NEW JERSEY 08071
(609) 589-5500

SUPER CHECKBOOK 3.0 — A vastly improved version of our popular selling program. With new features such as: simplified but powerful transaction entry and modification routines, new reconciliation routines, additional features such as 30 percent increase in the total number of checks handled, posting of interest from interest bearing checking accounts, automatic teller transactions, bullet proof error handling, and smart disk routines. Plus the program still contains the options of bar graphs, sorting, activities, and account status. Disk Only/AppleSoft \$34.95

Of special interest to owners of older versions of the program is a limited trade-in period ending May 31, 1981. Trade-in value \$19.95 cassette \$24.95 diskette. Original tape or diskette must be returned to receive new version plus \$1.50 freight and the difference between \$34.95 and the trade-in value. A conversion program is included to convert data files to the new format.

ADDRESS FILE GENERATOR — Allows the user to create any number of four types of address files: Holiday, Birthday, Home and Commercial. The program contains a menu of seven major commands used to Create, Add, Edit, Display, Search, Sort, and Reorganize Files. Up to three fields may be used for the sort criteria. Major commands have subordinate commands which adds to the flexibility of this powerful software system. We doubt you could buy a better program for maintaining and printing address files. Disk Only/Apple Printer Card/AppleSoft \$24.95

SPANISH VOCABULARY DRILL
FRENCH VOCABULARY DRILL
ITALIAN VOCABULARY DRILL
GERMAN VOCABULARY DRILL

These programs provide practice in foreign language vocabulary by means of three types of drills: Matching, Foreign Language to English and English to Foreign Language. Although the diskette comes with some lessons on it, these are intended to be samples. The most effective way to use these programs is to enter your own lessons from the course you are studying. To facilitate the entry of new lessons, each program contains a complete Lesson Editor which has various entry and revision options. The manual also contains instructions for converting the programs to other languages. Disk Only/AppleSoft each \$24.95

SPACE TREK J — Your mission is to patrol the galaxy, and to seek out and destroy the ships of the Klarian fleet. At your command is the starship Lexington. The Lexington has a wide variety of weapons, sensors and other devices useful in your mission. There are two kinds of Klarian ships: Regular and Super. Regular Klarians have an average energy supply of 5000 to 12000 quarks while Super Klarians have 12500 to 15000 quarks and are protected from some of the Lexington's weapons and attack strategies. Disk Only/AppleSoft \$19.95

WORLD OF ODYSSEY — An adventure game utilizing the full power of Disk II, which enables the player to explore 353 rooms on 6 different levels full of dragons, dwarfs, orcs, goblins, gold and jewels. The program allows the player to stop the game and to resume at a later time. Disk Only/AppleSoft \$24.95

GALACTIC EMPIRES — Pits 1 to 20 players against each other and the computer in a struggle for control of up to 40 star systems. The players compete by sending out fleets of ships to capture neutral planets and to attack the colonies of other players. The victor is the player who controls the most stars by game's end. Applesoft \$14.95

Dealer Inquiries Invited
Visa and MasterCard

POWERSOFT
P. O. BOX 157
PITMAN, NEW JERSEY 08071
(609) 589-5500

Missing A **MICRO**™ ?

If you are missing a back issue of **MICRO**, ask your dealer for that issue. He can assist you in completing your collection.

For a complete index to all technical articles, visit your local **MICRO** dealer. (He has an index listed by microcomputer, issue number, and "Best of" Volume.) See also the semi-annual index in **MICRO**, January 1981.

If your dealer does not currently stock **MICRO** back issues, ask him "Why Not?" Back issues may be ordered directly from **MICRO**, when necessary.

MICRO

P.O. Box 6502
Chelmsford, MA 01824
(617) 256-5514

I found that the easiest way to put the 7402 gate on the C1P is to use the proto position just next to the crystal, which is listed as U44. I used the 14 pin DIP socket, which I placed in the U44 proto position. There are two extra holes, which can be used as connection points for the transistor or for the resistors.

I used wire-wrap wire wherever hook-up wire was needed in the following connections. Pin 5 of the 7402, gate A, connects to pin 4 of U69. Pin 6 connects to the clock chain at U60, pin 12. The output of gate A, pin 4, connects to gate B, pins 2 and 3. The output of gate B, pin 1, connects to pin 11, one input of gate C. The second input of gate C, pin 12 is pulled to five volts, through the 10K resistor. The switch, SW1, is connected between pin 12 and ground. The output of gate C, pin 13, is fed through a 100 ohm resistor to the base of the transistor, to amplify the output for the speaker. R2 is connected from 5 volts to the collector of the transistor and the emitter is connected to ground.

The transistor can be mounted at any point. I put a connection strip on my speaker and connected the transistor on the speaker itself. The circuit is not critical, therefore almost any general purpose NPN transistor will work.

Pin 7 of the 7402 is the power ground, and pin 14 is the +5 volt supply. The remaining pins need not be connected to anything.

If you do not wish to use the on-off switch in the circuit, you can eliminate the pull-up resistor, R1, and pin 12 can be jumpered to pin 11.

After you carefully check your connections for solder bridges, you are ready to run.

David Ell is a technical serviceman, who recently moved to Portland, where he is currently employed at Western Skysways in the instrument service division. He is a member of the Ohio Scientific Users Group Northwest. He is also involved with amateur radio. Dave's computer is an Ohio Scientific Superboard II with various modifications, working in hand with a Sperry Univac DCT 500 ASR printer terminal system.

Some of the other things Dave has come up with are a 16 line I/O port, reverse video, selectable baud rate, piggy-backed memory, and a number of other usable ideas.

MICRO

MR. RAINBOW

presents our valuable free catalog (over 100 pages). He **PROMPTS** you to **PEEK** at the latest collection of software and hardware products for your **APPLE II™**



A STELLAR TREK

the definitive Hi-Res color version of the classic Star Trek game. Three different Klingon opponents. Many command prerogatives from use of weapons to repair of damages. Needs 48K Applesoft ROM. Disk... \$24.95

VERSAWRITER II

A drawing tablet, simply plugs into your game I/O port. Trace, draw, design, or color any type of graphic. Adds words to pictures. Creates schematics. Computes Distance/Area of any figure. New - fill any area on the screen in seconds with over 100 different and distinct colors. Needs 32K Applesoft ROM and disk drive. A bargain at... \$249.95

BOWLING DATA SYSTEM

This data management program provides accurate record keeping and report generation for bowling leagues of up to 40 teams with 6 bowlers per team. Needs 80-column printer, 32K Applesoft ROM. Disk... \$79.95

SUPER SOUND

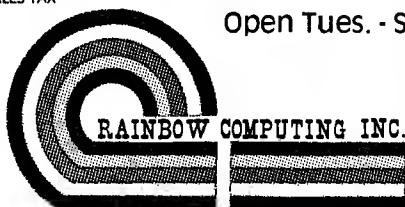
Musical rhythms, gunshots, sirens, laser blasts, explosions... add these and many more exciting sounds to your Apple. Use them in your programs, or create your own SUPER SOUNDS. Needs 16K Applesoft. Have a blast for only \$12.95... Tape \$16.95... Disk

ADD \$2.00 U.S. \$10.00 FOREIGN FOR SHIPPING
CALIFORNIA RESIDENTS ADD 6% SALES TAX

Don't see what you want here, then write or call today for your free catalog. We're saving one just for you.

Visa / Mastercharge welcome.

Open Tues. - Sun.



GARDEN PLAZA SHOPPING CENTER
9719 RESEDA BOULEVARD DEPT. 1MI
NORTHRIDGE, CALIFORNIA 91324
PHONE (213) 349-5560

Why Magazine Subscription Rates Go UP, UP, UP!

Due to general inflationary pressures and increased mailing costs, MICRO must increase U.S. subscription rates from \$15.00 to \$18.00 a year, effective April 1, 1980. The cover price will remain unchanged, however, so that U.S. subscribers will be saving 25% over single copy purchases.

International Politics Brings 90% Increase in Rates

Small Countries Outvote U.S. in International Publishing Council

Due to international politics, foreign subscription rates will increase in increments of 10% above the rates previously announced by MICRO.

The gigantic rate increase will result from the Universal Postal Union's vote to increase terminal dues, dues paid to another when the two exchange unequal amounts of mail. The four largest—U.S., Britain, France, and Japan—opposed the increase but were outvoted by the small countries.

MICRO's New Annual Subscription Rates (Effective Immediately)

MICRO™
Works to Reduce Rates!

To save European subscribers from the full impact of the international rate increase, MICRO has engaged a European airline which will air freight the magazine to Europe and there post it by surface mail. Air Mail subscribers should receive their copies no later than the middle of each month.

MICRO will attempt to make similar arrangements for other geographic areas. If so, subscriptions made at the new rates will be extended by the amount of the savings achieved.

U.S. (Effective 4/1/81)	Current \$15.00	New \$18.00
International Surface Mail		
Anywhere outside the U.S.	18.00	21.00
International Air Mail		
Europe	33.00	36.00
Middle East	39.00	42.00
Africa		
North	39.00	42.00
Central	39.00	51.00
South	39.00	60.00
Mexico, Central America	27.00	39.00
South America	33.00	51.00
Far East, Australasia	39.00	60.00

Does Anybody Really Know What Time it Is?

Add a real time, non-interruptable hardware clock/calendar to your 6502 system using a new clock chip and you will be as close to knowing as anyone can be.

Randy Sebra
54 Krouse Court
Aberdeen, Maryland 21001

A hardware real-time clock has several advantages over a software real-time clock. First, keeping time does not require interrupt driver software, thereby saving machine time overhead and RAM space. Next, the circuit described here can generate its own interrupts to the microprocessor if regularly spaced interrupts are needed. Finally, and perhaps most significant is that being non-interruptable with its battery backup, the time only has to be set when starting up the first time. Neither turning off the microprocessor system nor power outages affect the keeping of time.

The MSM5832

The MSM5832 from OKI Semiconductor is a CMOS clock/calendar chip made especially for bus-oriented microprocessor applications. Due to its special design, it offers many advantages over other types of conventional clock circuits when used with a microprocessor as a non-interruptable clock/calendar.

The MSM5832 keeps track of seconds, minutes, hours, day of the week, date, month, and year. Data is read and written by using a four bit bidirectional bus, when addressed by a four bit address bus. Table 1 shows the function of each address. Notice that in

ADDRESS INPUTS A0 A1 A2 A3	INTERNAL COUNTER	DATA I/O D0 D1 D2 D3	DATA LIMITS	NOTES
0 0 0 0	S 1	* * * *	0-9	S1 or S10 reset to zero whenever write is executed
1 0 0 0	S 10	* * * *	0-5	
0 1 0 0	MI 1	* * * *	0-9	
1 1 0 0	MI 10	* * *	0-5	
0 0 1 0	H 1	* * * *	0-9	
1 0 1 0	H 10	* * † †	0-1 0-2	D2="1", PM D3="1", 24 Hour D2="0", AM D3="0", 12 Hour
0 1 1 0	W	* * *	0-6	
1 1 1 0	D 1	* * * *	0-9	
0 0 0 1	D 10	* * †	0-3	D2="1", 29 days in month 2 (2) D2="0", 29 days in month 2
1 0 0 1	MO 1	* * * *	0-9	
0 1 0 1	MO 10	*	0-1	
1 1 0 1	Y 1	* * * *	0-9	
0 0 1 1	Y 10	* * * *	0-9	

(1) * Data valid as "0" or "1".
Blank does not exist (unrecognized during WRITE and held at "0" during READ).
† Data bits used for AM/PM, 12/24 Hour and leap year.
(2) If D2 previously set to "1", upon completion of month 2 day 29, D2 will be internally reset to "0"

Table 1: Functions

CONDITIONS	OUTPUT	REFERENCE FREQUENCY	PULSE WIDTH
HOLD = L	D0(1)	1024 Hz	duty 50%
READ = H	D1	1 Hz	122.1 us
CS = H	D2	1/60 Hz	122.1 us
A0-A3 = H	D3	1/3600 Hz	122.1 us

(1) 1024 Hz signal at D0 not dependent on HOLD input level.

Table 2: Reference Signal Outputs

addition to being able to program through software either a 12 or 24 hour format, leap years are handled quite easily. Leap years are controlled by bit D2 of address 8. When set, it gives the second month of the year a 29th day, and after the 29th day has elapsed, the bit is automatically cleared. The bit may be set any time after the second month of the previous year, and before the end of the second month of the leap year.

Another feature is a manual ± 30 second correction input. Perhaps the most unique and useful feature is the HOLD control which allows read/write operations to occur with the counters being held static, without disturbing the accuracy of the real time. Additionally, four different interrupt outputs are available to the microprocessor, as shown in table 2. Finally, the chip will operate on a battery back up as low as 2.2V with a power dissipation of less than 90uW, making long term backup quite attractive and economical.

Functions

The functions of the clock/calendar are best described on an individual basis as follows.

Oscillator (XT , \bar{XT})

A 32.768KHz(2^{15}) crystal is connected to an internal, stable oscillator to form an accurate time base. The two parallel capacitors, one of which is a trimmer, allow the oscillator to be tuned quite precisely.

A0-A3

These are the address inputs which are used to select the internal counters to be set or read on a read or write operation.

D0-D3

These are data inputs or outputs, depending on whether a read or write operation is being done. They are tri-state bi-directional ports controlled by the READ and WRITE controls.

Chip Select

This determines whether the inputs and outputs are active or inactive. Connecting the CS to Vcc activates the inputs and outputs, while connection to ground disables them. In the circuit in figure 1, the CS is permanently connected to +5V from the microprocessor system for battery backup configuration. When the main system is turned off, this disables all

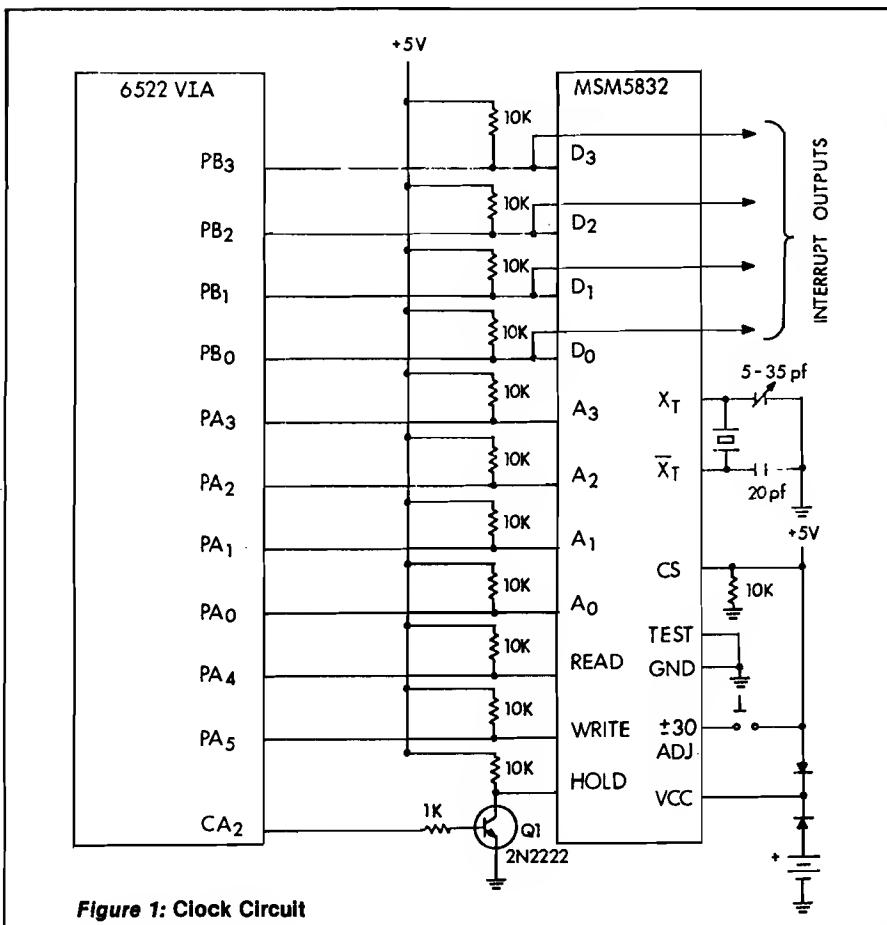


Figure 1: Clock Circuit

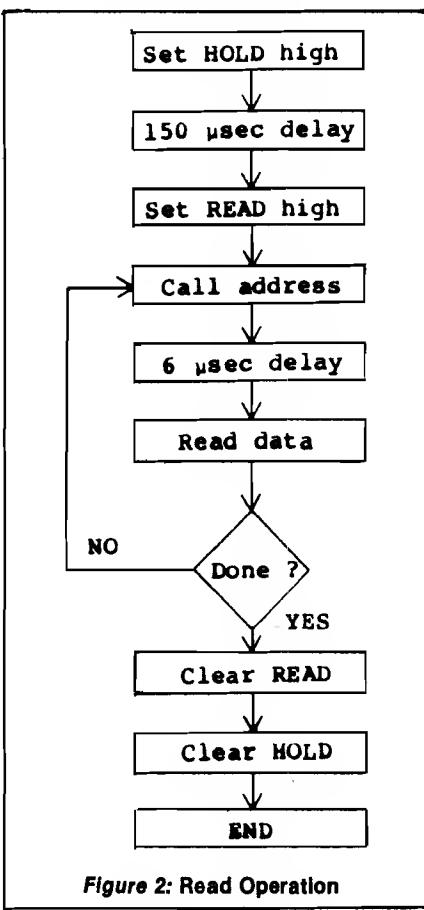


Figure 2: Read Operation

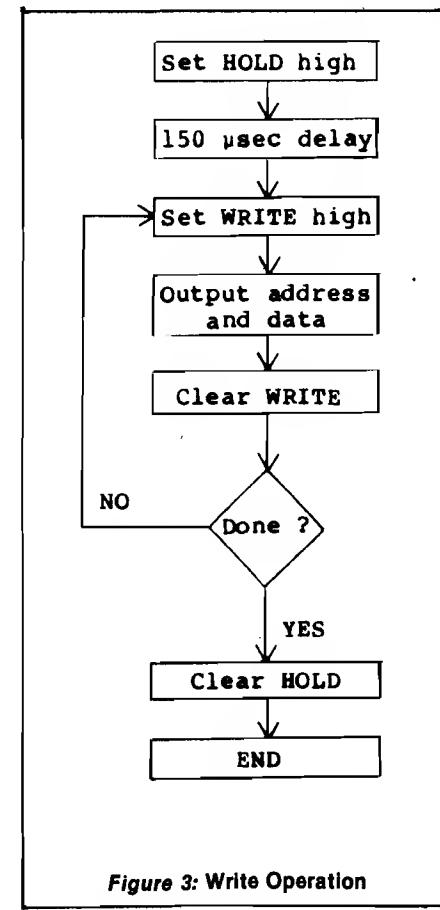


Figure 3: Write Operation

functions except the counting circuits, allowing very low power consumption while still keeping time by the battery backup.

Hold

A high on this line keeps the seconds counter from being incremented by the 1Hz clock output. After the initial set up time (150 microseconds), all counters will be in a static state, allowing error-free read and

write operations as long as the HOLD time is less than one second. Other clock circuits do not have this feature, and operations have to be done twice and compared to assure no error has been made.

Consider the following example with a conventional clock circuit. Suppose you are reading a time of 12 hours and 59 minutes. If the seconds count should be 59, and after the hours

(and before the minutes) are read, the seconds counter clears and sends a carry pulse, the time is then 13 hours, 0 minutes and 0 seconds. But the read operation has resulted in 12 hours, 0 minutes and 0 seconds—a full hour off. It is for this reason that with conventional clock circuits two reads have to be made to insure proper information has been received.

Read

This input, when taken to Vcc, signals a read operation.

Write

This input, when taken to Vcc, signals a write or set operation. This method of being able to directly set the time is far easier to use than conventional circuits in which pulses must be directed to either a fast set or slow set input, and the clock must read between pulses until the desired time has been set.

±30 Adjust

Momentarily taking this input to Vcc will reset the seconds count to zero. If the seconds count was 30 or more before this action, a carry is sent to the minutes counter. If less than 30, the minutes count remains unchanged. This means that keeping the time accurate is a very simple matter. If the switch in figure 1 is momentarily pressed at the start of a minute, this will automatically reset the time to the correct value as long as the clock is less than 30 seconds either fast or slow.

Test

This input allows testing of the operation of the clock. Pulses to this input will directly clock the S1, MI10, W, D1, or Y counters, depending on which one is addressed by A0-A3.

Reference Signal Outputs

Outputs are available from D0-D3 when READ, CS, and A0-A3 are at Vcc. These can be used as interrupts to the microprocessor. Table 2 presents the conditions for these signals.

Operation

Figures 2 and 3 present the flow diagrams for read and write operations. Although self-explanatory, there are several aspects of the operations which should be emphasized, especially for applications other than the specified one given in this article. First, the HOLD control must always be given at least 150 microseconds set up time, and *must* be used for WRITE operations. Next, since the read access time

Listing 1: Machine Language Routines

Machine language routines for MSM5832
Clock/Calendar circuit
Randy Sebra July, 1980

ACCESS	EQ	\$8B86	Un-write protect system RAM
\ORB	EQ	\$A800	Output register B
\IORA	EQ	\$A801	Input/output register A
\DDR8	EQ	\$A802	Data direction register B
\DDR9	EQ	\$A803	Data direction register A
\PCR	EQ	\$A80C	Peripheral Control Register

ORG \$0FA7 Start of routines

Routine to configure Port B and set HOLD high

OFA7-	20 86 8B	SETUP	JSR	ACCESS	Remove write protect
OFAA-	A9 3F		LDA	#3F	Set up PA0-PA5 as outputs
OFAC-	8D 03 A8		STA	DDRA	for address and control
OFAF-	A9 0C		LDA	#0C	Set CA2 low for high
OFB1-	8D 0C A8		STA	PCR	input to HOLD
OFB4-	A0 25		LDY	#25	Delay 150 microsec for
OFB6-	88	DELAY	DEY		HOLD time set up
OFB7-	DO FD		BNE	DELAY	
OFB9-	60		RTS		Return

Read routine

OFBA-	20 A7 OF	READ	JSR	SETUP	Set up HOLD
OFBD-	A9 00		LDA	#00	Configure PB0-PB3 as data
OFBF-	8D 02 A8		STA	DDR8	inputs for read
OFC2-	A2 0C		LDX	#0C	Initial address
OFC4-	8A	RDLOOP	TXA		Transfer to accumulator and
OFC5-	09 10		ORA	#10	combine with READ high
OFC7-	8D 01 A8		STA	IORA	Issue RFAD
OFCA-	EA		NOP		Small delay
OFCB-	EA		NOP		for read access time
OFCC-	EA		NOP		
OFCD-	AD 00 A8		LDA	ORB	Read data
OFDO-	29 OF		AND	#0F	Mask off high 4 bits
OFD2-	95 E9		STA	E9, X	Store to Page Zero
OFD4-	CA		DEX		Decrement address
OFD5-	10 ED		BPL	RDLOOP	Loop until through
OFD7-	A9 0E		LDA	#0E	Then set HOLD low
OFD9-	8D 0C A8		STA	PCR	by CA2 high
OFDC-	60		RTS		Return

Write routine

OFDD-	20 A7 OF	WRITE	JSR	SETUP	Set up HOLD
OFE0-	A9 0F		LDA	#0F	Configure PB0-PB3 as
OFE2-	8D 02 A8		STA	DDR8	data outputs for write
OFE5-	A2 0C		LDX	#0C	Set initial address
OFE7-	B5 E9	WRLOOP	LDA	E9, X	and fetch data
OFE9-	8D 00 A8		STA	ORB	Write data
OFEF-	8A		TXA		Combine address with
OFED-	09 20		ORA	#20	WRITE high and
OFEF-	8D 01 A8		STA	IORA	issue write
OFF2-	29 OF		AND	#0F	Toggle WRITE control
OFF4-	8D 01 A8		STA	IORA	
OFF7-	CA		DEX		Decrement address
OFF8-	10 ED		BPL	WRLOOP	Loop until through
OFFA-	A9 0E		LDA	#0E	Set CA2 high for
OFFC-	8D 0C A8		STA	PCR	low on HOLD
OFFF-	60		RTS		Return

of the chip may be as long a 6 microseconds, a delay must be built in before reading data. Additionally, notice that although the READ control may be held high for as many read operations as desired, the WRITE control must be pulsed between each write operation.

Interfacing

There are many ways which the MSM5832 can be interfaced with a 6502 or other microprocessor. The only requirement is eleven I/O lines, with four being bi-directional. For myself, the most convenient method was through the use of the #2 6522 VIA on my SYM-1. Figure 1 shows this configuration. If you do not have a 6522 available on your system, it is a relatively simple matter to add one. See "An Additional I/O Interface for the PET", by Kevin Erler, MICRO, December 1979 [19:40]. This is also applicable for Apple.

Transistor Q1 in figure 1 at the HOLD pin is used to invert the CA2 input to HOLD. The reason for this is as follows. On power up and reset, all registers in the 6522 are cleared. This causes all I/O lines to be configured as inputs with a high voltage on the pins, and the HOLD would be held high. When using a battery back up, this would cause the clock to stop until the HOLD is pulled low, since the hold time would always be longer than one second. With the HOLD being controlled separately by the CA2 output and inverted, this will always keep HOLD low unless intentionally taken high by software.

For battery back up, the chip select is connected to +5V from the 6502 bus, which disables all inputs and outputs when the system is off and the clock is on back up. The batteries used here are dry cells and the setup is a rather simple battery back up. A more elaborate setup could be used with Ni-CADs and with the +5V trickle charging the batteries when the system is up. This could give many years of continuous operation before having to replace batteries. The battery life in both cases, of course, is a function of how frequently (or infrequently) the main system is used.

Listing 2: Basic Routine and Sample Run

```

100 REM MSM5832 CLOCK/CALENDAR
110 REM SET/READ PROGRAM
120 REM RANDY SEBRA JULY,1980
130 REM
140 REM
150 DEF FNS(X)=INT(X/10)
160 DEF FNT(Y)=Y-FNS(Y)*10
170 INPUT"SET(S) OR READ(R) ? ",I$
180 IF I$<>"S" THEN 430
190 REM
200 REM GET INPUT AND STORE 1 INTO LOCATIONS $E9-$F5
210 REM
220 INPUT"MONTH, DAY, YEAR(2 DIGITS) ? ",M2,D,Y
230 POKE 245,FNS(Y)
240 POKE 244,FNT(Y)
250 POKE 243,FNS(M2)
260 POKE 242,FNT(M2)
270 POKE 241,FNS(D)
280 POKE 240,FNT(D)
290 INPUT"DAY OF THE WEEK(1-7) ? ",W
300 POKE 239,W-1
310 INPUT"HOURS, MINUTES(24 HOUR TIME) ? ",H,M
320 POKE 238,FNS(H)+8
330 POKE 237,FNT(H)
340 POKE 236,FNS(M)
350 POKE 235,FNT(M)
360 REM
370 REM CALL MACHINE LANGUAGE WRITE ROUTINE
380 REM
390 S=USR(&"OFDD",0)
400 REM
410 REM CALL MACHINE LANGUAGE READ ROUTINE
420 REM
430 R=USR(&"OFBA",0)
440 DIM D$(6),M$(11)
450 DEF FNR(I)=PEEK(I)*10+PEEK(I-1)
460 DATA SUNDAY,MONDAY,TUESDAY,WEDNESDAY,THURSDAY,FRIDAY,SATURDAY
470 DATA JANUARY,FEBRUARY,MARCH,APRIL,MAY,JUNE,JULY,AUGUST,SEPTEMBER
480 DATA OCTOBER,NOVEMBER,DECEMBER
490 FOR I=0 TO 6
500 READ D$(I)
510 NEXT I
520 FOR I=0 TO 11
530 READ M$(I)
540 NEXT I
550 REM
560 REM CONVERT PAGE ZERO DATA INTO APPROPRIATE UNITS
570 REM
580 Y=FNR(245)+1900
590 M2=FNR(243)
600 D=FNR(241)
610 W=PEEK(239)
620 REM
630 REM CONVERT HOURS, MINUTES, AND SECONDS INTO A
640 REM STRING FOR "CLEANER" OUTPUT"
650 REM
660 TS="""
670 FOR I=0 TO 4
680 TS=TS+RIGHT$(STR$(PEEK(237-I)),1)
690 NEXT I
700 TS=RIGHT$(STR$(PEEK(238)-8),1)+TS
710 TS=LEFT$(TS,2)+"."+"MID$(TS,3,2)+":"+"RIGHT$(TS,2)
720 PRINT"TODAY IS ";D$(W);";M$(M2-1);D;Y;TS
730 END
OK
RUN
SET(S) OR READ(R) ? S
MONTH, DAY, YEAR(2 DIGITS) ? 7,18,80
DAY OF THE WEEK(1-7) ? 6
HOURS, MINUTES(24 HOUR TIME) ? 13,8
TODAY IS FRIDAY JULY 18 1980 13:08:00

OK
RUN
SET(S) OR READ(R) ? R
TODAY IS FRIDAY JULY 18 1980 13:09:10

```

Machine Language Routines

Listing 1 presents machine language routines to set the clock/calendar and read the time. As shown by figure 1, PA0-PA3 go to address lines A0-A3, PA4-PA5 go to the READ and WRITE, PB0-PB3 go to data lines D0-D3, and CA2 is inverted and goes to the HOLD input.

Data to be written to the clock, and the data received from a read are stored in Page Zero locations \$E9-\$F5. These are "safe" Page Zero locations which are not used either by BASIC nor by the SYM monitor. For computers other than the SYM, other locations may have to be used, but virtually all 6502 computers will have Page Zero locations available.

The routines themselves are general routines which may be used for any 6502 computer since they do not use any monitor routines, except the routine necessary to remove the write-protect from system RAM. Of course, the locations for the 6522 will probably be different. The machine language is located so as to occupy the highest part of memory in a 4K system. They can be easily relocated, with the only changes required being the JSR's at locations \$0FBA and \$0FDD in listing 1.

Listing 3: Interrupt Set-up Routines

Machine language routines for
Setting up interrupts from the MSM5832
Randy Sebra July, 1980

ACCESS	EQ	\$8B86	Un-write protect system RAM
ORA	EQ	\$A801	Input/output register A
DDRB	EQ	\$A802	Data direction register B
DDRA	EQ	\$A803	Data direction register A
IFR	EQ	\$A80D	Interrupt flag register
IER	EQ	\$A80E	Interrupt enable register
ORG \$0F8C Start of routine			
0F8C-	20 86 8B	SETUP	JSR ACCESS Remove write protect RAM
0F8F-	A9 00		LDA #00 Set up B0-B3 (data
0F91-	8D 02 A8		STA DDRB lines) as inputs
0F94-	A9 1F		LDA #1F Set up A0-A4 (address
0F96-	8D 03 A8		STA DDRA lines and READ) as
0F99-	8D 01 A8		STA ORA outputs and set all high
0F9C-	A9 08		LDA #08 Set up IFR for interrupt
0F9E-	8D 0D A8		STA IFR from CB2
0FA1-	A9 88		LDA #88 Enable interrupt for
0FA3-	8D 0E A8		STA IER CB2
0FA6-	60		RTS Return

Applications

The obvious use for the clock/calendar interface is setting the time and getting the time output upon request. Using the machine language routines in listing 1 in conjunction with a BASIC driver is perhaps the most convenient method of accomplishing this. Listing 2 is an example of one such BASIC program, along with two typical resultant runs. The program, in order to set the clock/calendar, merely requests the necessary data and stores it into the proper Page Zero locations and then calls the machine language routine to do the actual setting. To insure that the input data was correct, a read is done after the setting as a check. For the read operation, the program calls the machine language to do the actual reading, and then merely arranges the data obtained from \$E9-\$F5 to be output in a convenient manner.

The memory size of 4006 is for a 4K system. The dummy tape save, SAVE D, is needed to overcome a bug in SYM BASIC. The program is loaded in as file "C". The machine language routines were saved as file \$4D, so that they can be loaded by the LOAD M command.

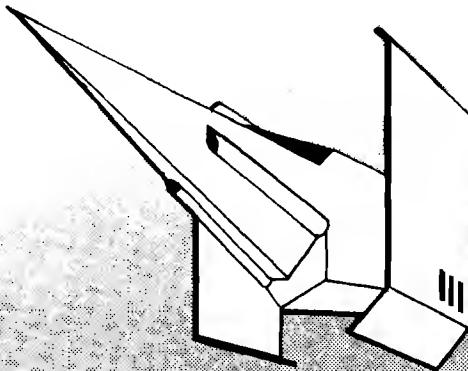
As mentioned previously, the clock can generate interrupts to the microprocessor. Since we are using a 6522 VIA in the interface, either of the two on-board timers can be used to generate precise interrupts of up to 0.65 seconds apart. With the MSM5832, we then can generate interrupts at one second, one minute, or one hour apart [see figure 1 and table 2].

Listing 3 presents a machine language routine to use any one of these three interrupts. Although the D1, D2 or D3 outputs could be tied directly to the IRQ line of the 6502 system, in this example one of the outputs goes to the CB2 input of the 6522. The routine has been set up so that the interrupt occurs on the negative-going edge of the 122.1 microsecond pulse. If setting on the positive edge is desired, merely write a \$20 in the PCR register of the 6522. In whatever interrupt routine used with this setup, the IFR register bit can be cleared, either by directly writing into the IFR, or by reading or writing to Port B. This may be accomplished by reading the time with the routines in listing 1. Note, however, that reading the time reconfigures Port A, and this must be reset to the configuration in listing 3.

An obvious use of this type of operation would be to use an interrupt of one second when using a video display or terminal with an addressable cursor, to continually write the time in the upper right hand corner of the screen. A much more effective use would be in a polled environment where it would be desirable to get data from input ports or status of peripherals every second, minute, or hour.

Special note: The MSM5832 is a fairly new chip, first introduced in the first quarter of 1980. For this reason, it is not commonly available, except in quantity from the manufacturer. If there is sufficient reader interest in using the circuit described in this article, I can supply the chip and the 32.768 KHz crystal for \$17 plus postage. Delivery may take 4 to 6 weeks.

MICRO™



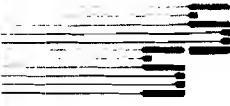
SIRIUS SOFTWARE PRESENTS

Action Software For The Apple

E-Z Draw

E-Z DRAW is the software that started it all...the poor man's graphic tablet. But now it has been updated to 3.3 DOS and completely rewritten for the professional user. E-Z DRAW now includes the powerful HIGHER TEXT character generator written by Ron and Darrel Aldrich. With our new routines the fonts or any part of the picture can be flipped upside down, slanted left or right, rotated 90 or 180 degrees, mirrored or any combination of the above. Also the fonts or parts of the screen can be expanded in width or height, or compressed in height or width. You can mix portions of pictures together, or save only a portion of the screen on disk. Now fully keyboard controlled for better accuracy. Professional documentation and 20 different and imaginative type styles included. Also included are commands to print the hi-res screen on the Trendcom or Silentype printers. Updates are available for the customer who already purchased E-Z DRAW 2.0. The update is only \$10.00 for those who return their original disk directly to us...please don't bug your dealer for the update.

*APPLE II is a registered trademark of Apple Computer, Inc. HIGHER TEXT is a copyrighted product of Synergistic Software. Trendcom is a registered trademark of Trendcom. Silentype is a registered trademark of Apple Computer, Inc. E-Z DRAW is a copyrighted product of SIRIUS SOFTWARE. All rights reserved.



Sirius Software

1537 Howe Ave, Suite 106, Sacramento, CA 95825

NIKROM TECHNICAL PRODUCTS PRESENTS A DIAGNOSTIC PACKAGE FOR THE APPLE II AND APPLE II + COMPUTER.

"THE BRAIN SURGEON"

All major computer systems are checked for functional hardware analysis on a regular basis for logical as well as some practical reasons. Finding what is exactly wrong can account for most of the money consuming down-time.

Apple Computer Co. has provided you with the best equipment available to date. The Diagnostic's Package was designed to check every major area of your computer, detect errors, and report any malfunctions. *The Brain Surgeon* will put your system through exhaustive, thorough procedures, testing and reporting all findings.

The Tests Include:

- MOTHERBOARD ROM TEST FOR BOTH APPLE II AND APPLE II +
- APPLESOFT CARD TEST • INTEGER CARD TEST • MEMORY RAM TEST
- DISK DRIVE ANALYSIS • MONITOR ALIGNMENT
- DC HAYES MICRODODEM II TEST

System Diagnosis is an invaluable aid to your program library even if your system is working fine. Hours have been wasted trying to track down a "program bug" when actually hardware could be the blame!

The Brain Surgeon allows you to be confident of your system. This can be critical when file handling, sorts or backups are involved. You *must* depend on your computer during all these critical times. Running *The Brain Surgeon* prior to these important functions helps to insure that your system is operating at peak performance.

The Brain Surgeon is easy to use and supplied on diskette with complete documentation.

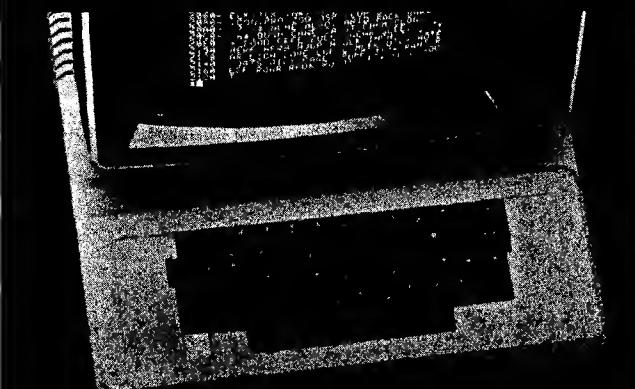
PRICE: \$45.00
REQUIRES: 32 or 48K
APPLESOFT In ROM, 1 Disk Drive
SPECIFY: DOS 3.2 or 3.3

Nikrom Technical Products
23 PROSPECT STREET • LEOMINSTER, MA 01453

APPLE is Registered
Trademark of Apple Computer Co.
MICRODODEM II is Registered
Trademark of D.C. HAYES



Apple Monitor Extender



APPLE II 16K, CASSETTE

This utility program works in complete harmony with the Apple monitor to extend your computer's capability and help you use the full power of machine language programming.

Screen display shows memory in HEX, ASCII or BINARY. Move data anywhere in memory without regard to direction or overlapping and read or write any sector on disk. Insertions may be in HEX or ASCII so you can easily format high speed text displays without conversions.

Study, modify or disassemble any program, complete with labels. Several programs may be combined, and the entire disassembled text file stored on disk/tape for later assembly.

The slow listing feature steps through listings with ease.

Copyright 1980 Glenn R. Sogge, All Rights Reserved.

IMAGE COMPUTER PRODUCTS

615 Academy Drive
Northbrook, IL 60062
312/564-5060

—MICRO Classifieds—

A classified ad in MICRO will bring your products/services to the attention of thousands of readers. These ads are placed in clusters throughout the magazine. Each classified ad costs only \$10.00 per insertion. Please limit these to no more than 40 words. Title line, name and address are not considered in the count. (See classifieds on page 64.) Ads must be pre-paid and received before the twentieth of the month preceding the month of publication. Ads received after this date will be scheduled for the following month's issue. Send to:

MICRO — Classifieds
P.O.Box 6502
Chelmsford, MA 01824

★ SOFTWARE FOR OSI

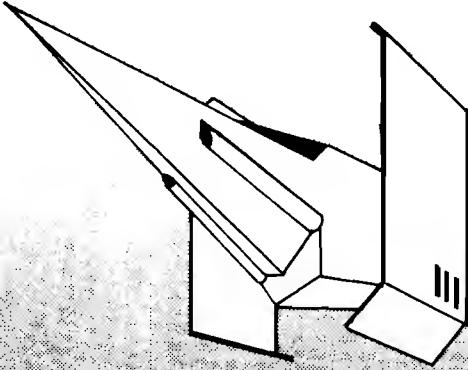
- ★ **VIDEO GAMES 1** \$15.
Three Games. Head-On is like the popular arcade game. Tank Battle is a tank game for two to four. Trap! is an enhanced blockade style game.
- ★ **VIDEO GAMES 2** \$15.
Three games. Gremlin Hunt is an arcade-style game for one to three. Gunfight is a duel of mobile artillery. Indy is a race game for one or two.
- ★ **ADVENTURE: MAROONED IN SPACE** \$12.
An adventure that runs in 8K! Save your ship and yourself from destruction.
- ★ **DUNGEON CHASE** \$10.
A real-time video game where you explore a twenty level dungeon.
- ★ **BOARD GAMES 1** \$15.
Two games. Mini-gomoku is a machine language version of five stones gomoku. Cubic is a 3-D tic-tac-toe game. Both with graphics.
- ★ **DISASSEMBLER** \$12.
Use this to look at the ROMs in your machine to see what makes BASIC tick. Reconstruct the assembler source code of machine language programs to understand how they work. Our disassembler outputs unique suffixes which identify the addressing mode being used, no other program has this!
- ★ **SUPER! BIORHYTHMS** \$15.
A sophisticated biorhythm program with many unique features.
- ★ **C1 SHORTHAND** \$12.
Use only two keys to enter any one of the BASIC commands or keywords. Saves much typing when entering programs. Written in machine language.



For all BASIC-in-ROM systems. Selected programs available on disk. Color and sound on video games.

Send for FREE catalog

ORION SOFTWARE ASSOC.
147 Main St. Ossining, NY 10562



SIRIUS SOFTWARE PRESENTS

Action Software For The Apple

Both Barrels

This package features two games: HIGH NOON and DUCK HUNT. Fun for the very young and the young at heart...you'll love the bad guy that falls off the roof and the dogs fighting over the ducks.

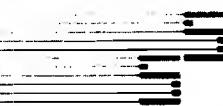
Star Cruiser

STAR CRUISER is a fast action arcade game that can be played by ages 3 and up. SOFTALK magazine rated this one number three...need we say more?

Cyber Strike

CYBER STRIKE This is brand new game for the APPLE II...a hi-res action adventure in space with a full 48k of Assembly Language programming with animation and 3-D effects you haven't seen before. MIND BOGLING! Everyone said a game like this wasn't possible on the APPLE II, but we did it. Also includes a real time clock (software implemented) and several levels of play. WARNING...THIS GAME REQUIRES PRACTICE TO PLAY SUCCESSFULLY! Uses either 13 or 16 sector APPLE II, II+, or III.

*APPLE II is a registered trademark of Apple Computer, Inc. HIGHER TEXT is a copyrighted product of Synergetic Software. BOTH BARRELS, DUCK HUNT, HIGH NOON, STAR CRUISER, and CYBER STRIKE are all copyrighted products of SIRIUS SOFTWARE. All rights reserved.



Sirius Software

1537 Howe Ave, Suite 106, Sacramento, CA 95825

This February issue of the Ohio Scientific Small Systems Journal consists entirely of an introduction to the world of Artificial Intelligence (AI). We hope that you enjoy it.

The Use of Microcomputers in Artificial Intelligence Research

INTRODUCTION

In the first issue of *AI Magazine* (see reference 1), a publication of the newly-founded American Association for Artificial Intelligence (AAAI), Artificial Intelligence is defined as "that part of Computer Science concerned with the symbol-manipulation processes that produce an act or decision that is goal-oriented, arrived at by an understandable chain of symbolic analysis and reasoning steps, in which knowledge of the world informs and guides the reasoning."

A simpler definition is offered by Phillip C. Jackson in his book *Introduction to Artificial Intelligence* (see reference 2): "Artificial Intelligence is the ability of machines to do things that people would say require intelligence." This definition does not specify how to tell that a machine has intelligence on a human level, but that problem was solved nicely by A.M. Turing in 1947 (see reference 3). In Turing's classic test, a human interrogator is allowed to question two sources, one human and one machine, on a particular topic of intellectual endeavor. The responses of the two sources are presented through a common, neutral medium such as a teletype, to mask their origin. If the interrogator is unable to determine which source is responding (with accuracy significantly greater than 50%) and this result continues to hold as the experiment is repeated with various human sources and human interrogators, then the machine has exhibited artificial intelligence.

Now, there is widespread and justifiable doubt that a machine will ever exhibit human-like intelligence in a general sense. But this is not required by the preceding definitions. In Turing's test the interrogation takes place in a particular, restricted area of human endeavor. If a machine passes Turing's test, then it has simulated human intelligence, but only in this restricted area. In some areas there has been a good deal of success. But in other areas, natural language, for example, machine simulation of even a child's ability seems to be extremely difficult. Therefore, rather than debate the existence of artificial intelligence in general, it is more fruitful to concentrate on particular aspects of human intellectual ability.

When an artificial intelligence research project seeks to program a machine to imitate expert human behavior in a specific intellectual area, it is called knowledge engineering. The specific area is called the task domain of the project. In the next section, we will survey some of the most active task domains. The discussion there is intended to be illustrative, not comprehensive. We will concentrate below (see *Natural Language Process-*

OHIO SCIENTIFIC'S

ing) on the very complex task domain of natural language. The final section contains a description of recent progress made at Ohio Scientific on the development of language understanding programs for Ohio Scientific microcomputers.

EXAMPLES OF AI TASK DOMAINS

Writing a program that plays "perfect" Tic-Tac-Toe is a relatively simple exercise. The goal states or winning positions in this game are relatively few and the number of ways a player can reach one of the winning positions is also quite limited. The program can be constructed so that the computer makes each of its moves based on a complete analysis of all possible moves.

Unfortunately, most task domains are far more complicated than Tic-Tac-Toe. Games such as chess simply have too many states to make feasible a brute force approach—one that requires sequential consideration of all possibilities. Other activities of the human mind, such as theorem-proving, visual perception, and natural language processing, involve cognitive processes that are only partially understood. Here, AI research goes hand in hand with work in cognitive psychology. As we learn more about how humans resolve ambiguities, fill in missing details, and make judgments and decisions on intuitive levels, we will be better able to create computer simulations of these mental processes. This will surely be enormously difficult, but it would be a mistake to be overly pessimistic about the limitation of artificial intelligence. If the human mind possesses awesome powers that we are just beginning to understand, then it probably has the power some day to train a computer to do things that are presently unimaginable. Indeed, in many task domains, AI researchers have made progress that has greatly exceeded what was thought possible only a generation or so ago. This progress can be attributed partly to advances in hardware and partly to advances in the modelling of cognitive processes.

A good example is the task domain of chess. Just twenty years ago, the fact that computers could not be programmed to play any better than a beginner's level was used by many as "proof" of the limitations of artificial intelligence. The number of different chess games that could be played, approximately 10^{120} (see reference 4) was thought to be an impossibly large number. Today, of course, there are many outstanding chess-playing programs available (a very good one, SARGON II, is available for Ohio Scientific computers). There are several competitions for chess-playing programs and the winners usually play at close to championship levels. Sophisticated search techniques, that reduce the number of moves the computer must consider and techniques that allow the computer to "learn" from previous mistakes, are generally features of these programs.

Another active task domain is problem solving and decision making. One of the earliest programs was the classic General Problem Solver (GPS) of Newell, et al. (see reference 5). This program, with

CALL 1-800-321-6850 TOLL FREE

SMALL SYSTEMS JOURNAL

later refinements, was able to solve a wide variety of problems that had a well-defined goal or solution state and list of actions that could possibly modify present states. This restriction on the kind of problems that GPS would accept is an example of the modelling assumptions that must be made on how a human thought process takes place before it can be computer-simulated. The program SAINT is an example of a symbolic manipulation problem solver. More specifically, it solves integration problems at about the level of a first-year calculus student.

Pattern perception is the task domain in which we seek to make order out of apparent disorder. The kinds of patterns we hope to discern might be based on sounds, symbols, or even forms of reasoning, but artificial intelligence has been especially concerned with visual patterns (see reference 6). One of the most important applications is the development of machines with limited "reading" ability (e.g., the ability to read zip codes for the postal service). Another area of current activity is the development of special-purpose remote visual sensors ("seeing-eye robots") for certain medical procedures and industrial operations. In April of 1981, the first international conference on Robot Vision and Sensory Controls (ROVISEC) will be held.

The final task domain we will discuss is that of natural language. There are really two aspects to consider. The first, spoken language, involves a decoding, or pattern-matching, of sound to language symbols (voice input) or the generation of sound from language symbols (voice output). Much progress has been made on voice output. Ohio Scientific currently offers a complete package, that includes the Votrax voice synthesizer, that is useful for experiment or development in this area. Because of the range of human voices and language dialects, the problem of voice input is much more complicated. One way of simplifying this problem is to restrict greatly the context of the voice input message. For example, systems are currently being developed that will "understand" a user's spoken request for airline flight information or reservations.

The second aspect of natural language is written language. Here we assume we have the actual specific language representation of a message and we seek somehow to understand it and properly respond. In the next section, we will focus on the difficulties faced by artificial intelligence researchers who try to develop computer simulations of this process.

NATURAL LANGUAGE PROCESSING

Complexity of the General Problem

There are two extreme opinions on the solution of the natural language problem. The first is that it can't be done, usually based on the premise that human intelligence is so complex that we'll never fully understand it. The second attitude is that it can be done, and the only problem is to string together enough hardware and software.

Most probably, neither of these extreme views is correct. The more likely and a somewhat more

reasonable view is that certain aspects of natural language processing can be accomplished by a computer. Note that the word "processing" has been used rather than "understanding" or "comprehension." This more neutral term avoids ascribing consciousness to machines and comparing it with human consciousness.

In the past ten years much progress has been made in the field of artificial intelligence. Several systems have been demonstrated (see Green's and Lindsay's papers, reference 7; also, reference 8) which will handle natural language input. Many theoretical systems have been suggested to process the large corpus that is natural language. While the theoretical systems exist, only small portions of them have been implemented to any degree. Winograd's theoretical system for understanding natural language (see reference 9) is relatively complete but it has been demonstrated only for a small block manipulation environment. There are a number of similar examples from major research centers operated by Stanford University, Carnegie-Mellon University, Massachusetts Institute of Technology, Bolt, Baranek, and Newman, Inc., and International Business Machines Corp. Why is it that the accomplishments of those interested in natural language processing have not matched their ambitions? It is certainly not due to lack of resources or talent. Rather it can be attributed to the enormous complexity of the task. There is a finite set of words, but the set of sentences that can be generated is theoretically if not practically infinite. Even with severe restrictions on vocabulary size and grammatical form, the problems of natural language processing are still substantial.

Rather than attempt to solve the whole problem, which is the usual approach, the approach used at Ohio Scientific has been to construct a system which would handle a small domain of natural language usage. This approach allows us to deal with a smaller vocabulary and to analyze a smaller number of syntactic forms. While semantic analysis remains a complex problem, response generation, the ultimate test of success, can be evaluated in this limited context.

The following sections will discuss the construction of characteristics of the dictionary or vocabulary, the syntactic or parsing analysis, the semantic analysis, and finally the response generation.

Construction of a Limited Understanding System

The Dictionary: The task of the dictionary is to provide a vocabulary which will form the basis for a series of functions that the machine will perform. The bulk of a dictionary should consist mainly of nouns and verbs, the content words. The selection of adjectives and adverbs depends upon the particular domain that is to be considered.

While the vocabulary may be of limited size, it is functionally much larger, because many words have multiple usages. The most difficult category to select is that of verbs. Frequency of usage is the easiest criterion to employ. Since many verb

OHIO SCIENTIFIC'S

forms are irregular, care must be taken to include these as separate entries. All the common modal or linking verbs can be included, even in a vocabulary of limited size. Pronouns, adverbs, prepositions, and conjunctions are relatively few in number. Thus, all the common ones can be included.

The dictionary developed for the Ohio Scientific programs satisfies all of the above conditions. It also has the following features:

Grammatical Usage and Function: Each word entered has a part of speech tag and a function tag attached. The first tag indicates the part of speech. The second tag indicates its usage. For example, the noun JOHN would be classified as Animate, Person, Proper Name. While the word CUSTOMER would be classified as Animate, Person, Generic.

Verb classifications include information as to whether the verb is modal (could, would) or linking. Regular and irregular forms are distinguished as are verbs of action, cognition, identity and part-whole relations. A tense indicator is included for irregular forms. The part of speech and function information will be used in the parsing section of the program.

Multiple Usage: One characteristic of English is that one word may serve as several different parts of speech. For instance, the word AVERAGE can be a noun, a verb, or an adjective. Compute the AVERAGE, AVERAGE these numbers, and AVERAGE rainfall show these multiple usages.

Words that have multiple usages are given additional tags. The word AVERAGE has three different tags. Where possible, these tags are in terms of frequency of usage.

Root Word Approach: For the most part, only root words appear in the dictionary. Plural forms, possessive forms, tense forms are determined by information derived from a "snipping" routine. This approach accomplishes two things. First, the vocabulary can be kept relatively small. Second, the information from the ending can be used to determine the part of speech and function that is to be applied to the root word.

Irregular verb forms and certain contractions require a separate dictionary entry. Separate entries are also required for irregular forms of adjectives.

It is not possible to develop a list of functions for all the words that lead to an exhaustive set of categories. A less than exhaustive category list results in certain anomalies. If the words WEAK and GREEN are treated as adjectives indicating quality, then there may be no provision for determining the illegal form GREENLY.

As the vocabulary is currently constituted, it is relatively easy to add new entries. If new entries involve no modification of the category identifiers, they can be inserted into the dictionary with little difficulty. Words currently in the dictionary can be deleted or their tags can be altered to fit current usage.

Syntactic Analysis (Sentence Parsing): The goal for a sentence parsing program is to decompose

the string of words or phrases and to determine the relationships between these various parts. The most popular approach to this task in the psycholinguistic literature has been the transformational grammar approach of Chomsky (see reference 2). This method involves taking all forms of a sentence and applying transformational rules to yield the basic or kernel sentence. This approach, while simple to describe, is difficult to do. Also, several authors (see references 8 and 10) have suggested that the transformational approach is more suited to sentence production than recognition. There are also several other approaches to syntactic analysis.

Word Serial Position: The ordering rules in English are not as regular as in many languages. For most simple dialogue, word serial position can give much information about the relationships between words. The Simple Active Declarative (SAD) form usually consists of Noun-Verb-Noun. Word serial position, along with the part of speech and function tag, can be used to assign sentences to various general types. For example, a verb in position one usually signals an imperative mode. A WH pronoun (e.g., Who, What, Where, Why) in position one usually signals a question.

Word serial position and the grammatical tags may be used to develop a network to determine permissible and non-permissible sentences. This could also be used to assign the program to the appropriate response mode.

Phrase Boundary Analysis: This approach to parsing attempts to divide the sequence of words into its constituent structure, primarily noun and verb phrases. The constituent structure is then represented by a tree diagram or a series of brackets showing the relationship between the constituent parts. The classical example is the sentence "They are eating apples" which has two distinct meanings. Constituent analysis allows one to determine how structure points to one or the other.

(They^{NP}) (are eating^{VP}) (apples^{NP}.)

(They^{NP}) (are^{VP}) (eating apples^{NP}.)

The advantage of the phrase approach is that it deals with larger units than words and can eliminate a number of parsing steps that add little information. The disadvantage of this approach is that many sentences cannot be disambiguated using this approach. For example, the sentence "Flying planes can be dangerous" does not parse out into the two possible meanings.

Examples like the above are used to point out the weakness of a phrase boundary approach but the response is that this sentence would be clearly perceived if the context were known.

Clark and Clark (see reference 9) provide some strategies for determining the phrase structure of a sentence. These rules are relatively clear cut and can be adopted into a parsing program. As with the Word Serial Order, there are relatively stable patterns that occur in the constituent structure, and these can yield information about sentence type.

CALL 1-800-321-6850 TOLL FREE

SMALL SYSTEMS JOURNAL

Sentence Frame: A good deal of information about sentence structure can be gathered from the endings that are attached to words. A sentence frame approach makes use of this information and the position of the function words.

The _____s have _____en the _____s

The foxes have eaten the chickens

This frame can be used to determine that the second word is a noun and the fourth word a past participle and the last word a noun used in the objective case.

Another approach that would utilize the sentence frame would be to limit the types of frames that would be accepted. This might be a good approach for a small demo project, but it obviously limits the generality of the program.

osi cont again
1st run

Augmented Transition Networks: One approach developed in the early 70's sought to reduce the complexity by using a system called Augmented Transition Networks (ATN). The basic task of the ATN is to reduce the sentence to a set of relationships indicating Action, Actor, and Object. Augmented Transition Networks can handle conditional statements, relative clauses, and passive transformation.

The analysis of a sentence using ATN's proceeds in a left to right fashion. The contents of each register can change as the analysis proceeds. Thus, each register has a state description, but this description can change the state of another register. For the example of "The man was bitten by the dog," the initial state of man as actor is changed to object as a result of the detection of "by the dog." The ATN approach has sufficient strength to handle alternative sentence structures but, at the same time, is simple enough to be processed quickly.

One of the most complete models that has used the ATN approach is one developed by Winograd (see reference 8). The demonstration part of the system consists of an artificial robot whose response to commands is shown on a video display. The robot manipulates a number of objects with different shapes and can report upon their status. The program is written in LISP and runs on a PDP-10 and requires 80K of core. The system consists of a dictionary, grammar, semantic analyzer and several specialized subprograms such as Planner and Programmer. The system accepts typed input and carries out commands and answers questions in 5-20 seconds.

Semantic Analysis: The previous section on syntactic analysis has focused on the decomposition or parsing of a sentence. The next step is to use this information to determine the semantic relations or the "meaning" of the sentence.

Implicit in any approach to semantic analysis is the concept of a knowledge base. The form and use of the knowledge base are particularly sticky problems. Let us use a particular example to introduce this topic. Suppose we input the question,

"Is John taller than Mary?" This sentence could be paraphrased as "Male person greater (height) than female person?" Even a more general form might be "Object A possesses more (quantity) Object B." If there is specific information about John and Mary in our knowledge base, the question can be easily answered. If our knowledge base contains only a fact that shows males are usually taller than females, an inference can be drawn in response to the question. If Object A and Object B have some attributes in common, a comparison can be made and a response derived. The crucial question then becomes how to structure the knowledge base. This is a very complicated problem that is intertwined with the problem of response generation.

Response Generation: ELIZA (see reference 2), a program that simulated a psychotherapist, solved the response generation problem quite easily by simply responding "that's interesting; tell me more", "I understand" or something similar whenever the input sentence contained none of a limited number of key words. But any practical language processing system (including human beings) cannot respond meaningfully to every input sentence. Basically, response generation involves a mapping of the meaning of the input sentence to some capability of the machine. Thus, a declarative statement such as "I ran three miles today" might be "understood" quite thoroughly by a language processor but no meaningful response can be generated unless, for example, the program also has the capability of storing the input sentence's content in, say, the exercise log of the user's personal health data base.

Next month, we will expand upon the response generation problem in a description of experimental language processing work undertaken at Ohio Scientific.

References

1. *AI Magazine*, American Association for Artificial Intelligence, 5147 Angeles Crest Highway, LaCanada, California 91011.
2. *Introduction to Artificial Intelligence*, by Phillip C. Jackson, Mason/Charter Publishers, 1974.
3. "Intelligent Machinery," by A.M. Turing (1947); reprinted in *Machine Intelligence 5*, edited by B. Meltzer and D. Michie, 1970.
4. "Programming a digital computer for playing chess," by C.E. Shannon, *Philosophy Magazine*, 41 (1950), pp. 356-375.
5. "GPS, a program that simulates human thought," in *Computers and Thought*, edited by Feigenbaum and Feldman, McGraw-Hill, 1963.
6. *Pattern Classification and Scene Analysis*, by R.O. Duda and P.E. Hart, Wiley, 1973.
7. *Computers and Thought*, edited by Feigenbaum and Feldman, McGraw-Hill, 1963.
8. *Understanding Natural Language*, by Terry Winograd, Academic Press, 1972.
9. *Psychology and Language: An Introduction To Psycholinguistics* by Clark and Clark, Harcourt, Brace and Jovanovich, 1977.
10. "Transition Network Grammars for Natural Language Analysis," *Communications of the ACM*, 1970, 13, pp. 591-606.

OHIO SCIENTIFIC 1333 S. Chillicothe Road • Aurora, Ohio 44402 • (216) 831-5600

PET and APPLE II Users

PASCAL

ABACUS Software makes available its version of TINY PASCAL for the users of two of the most popular personal computers.

TINY PASCAL is a subset of the standard PASCAL as defined by Jensen and Wirth. It includes the structured programming features: IF-THEN-ELSE, REPEAT-UNTIL, FOR TO/DOWN TO-DO, WHILE-DO, CASE-OF-ELSE, FUNC and PROC. Now you can learn the language that is slated to become the successor to BASIC.

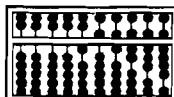
TINY PASCAL is a complete package that allows you to create, compile and execute programs written in the PASCAL language. You can save source and object code on diskette or cassette (PET version only). Comprehensive user's manual included. The manual can be examined for \$10 (refundable with software order).

REQUIREMENTS

PET 16K/32K New ROMS cassette	\$40
PET 16K/32K New ROMS diskette	\$35
Apple II 32K Applesoft ROM w/DOS	\$35
Apple II 48K Applesoft RAM w/DOS	\$35
TINY PASCAL User's Manual	\$10
6502 Interpreter Listing	\$20



FREE postage in U.S. and CANADA
All orders prepaid or COD



ABACUS SOFTWARE
P. O. Box 7211
Grand Rapids, Michigan 49510

Having Trouble Finding KIM & AIM Software?

LOOK NO MORE!

MICRO sells software packages that may be just what you have been searching for!

All products come complete with full user/operator instructions, a cassette tape and, with the exception of MICROADE, a complete set of source listings.

	CASSETTES/ MANUALS
KIM	
KIM Microchess	\$15.00
HELP Mailing List	15.00
HELP Info Retrieval	15.00
MICROADE	25.00
AIM	
Microchess	15.00

To place your order, write or call:

MICRO
P.O. Box 6502
Chelmsford, MA 01824
(617) 256-5515

Dealer Inquiries Invited

MARKET CHARTERTM



STOCK CHARTING ON YOUR APPLE II*

Market Charter. \$129.95

- High-Low-Close Bar Charts
- Simple, Exponential, Weighted Averages
- Trendlines, Resistance Lines, etc.
- Volume Charts with average volume
- Hard Copy of the Charts and Data
- Comparison Charts
- Weekly & Daily Stock Histories available
- User Oriented
- User can create and update the Data base
- Many Satisfied Users

DowLog-MC. \$69.95

- Automatically update data
- Quick, easy & inexpensive

RTR SOFTWARE, INC.

Dept. M-1
1147 BALTIMORE DR.
EL PASO, TEXAS 79902
(915) 544-4397



*TRADEMARK OF APPLE COMPUTER, INC.

THE MAILING LABEL AND FILING SYSTEM

From Avant-Garde Creations

only \$24.95 ppd.

This unique system will handle both your filing needs and your mailing label needs.

It's uniqueness starts with user-determined variables (up to 10 options) and continues with a special COUNT/SORT routine that allows the user to sort up to 9 VALUES for each of any 9 (out of 18) variables. It will print mailing labels, do a regular print-out or just display the criteria-meeting records while it counts them. It will also range-sort for 3 particular variables.

It makes an alphabetized directory of names and record numbers. You can find records by name or by numbers in seconds. If you don't know the exact spelling there's a quick-find option for directory-reading.

You can customize your labels and print up to 6 lines of your variables on them.

It includes special quick-copy and backup programs.

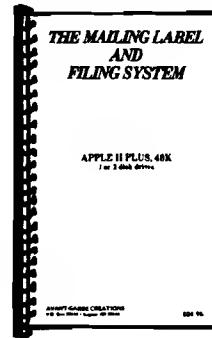
An easy to use system, brimming with options and dynamics, which ends the need for separate filing and mailing label programs.

Includes 40-page program manual and disk. APPLE II PLUS, 48K, one or two disk drives.

\$24.95 ppd.
We accept VISA/Mastercharge

Write for our detailed brochure
and more information:

Avant-Garde Creations
P.O. Box 30161
Eugene, OR 97403
(503) 345-3403
noon until 6:00 pm
Dept. m



MICRO

Software Catalog: XXIX

Name: **What's That Song?**
System: Apple II or Apple II Plus
Memory: 16K
Language: Machine
Hardware: No special hardware required.

Description: The Apple II begins playing a song from its repertoire of well-known melodies using its built-in speaker. The melodies included cover a wide range of musical selections. The computer asks the first player who recognizes the song to type in the title. The program has a unique comparison algorithm that eliminates the necessity of typing the song title exactly; but it will not accept just anything! It also keeps score for one to three players. The Apple knows 151 songs; how many do you know?

Price: \$24.95 includes cassette, operating instructions.
Author: **Daniel J. Hughes**
Available: **JDeL LectricWare, Inc.**
P.O. Box 9140
St. Louis, MO 63117

Name: **Applesoft Renumber/Merge in ROM**
System: BASIC Apple II or Apple II Plus
Memory: 48K
Language: Assembly (ROM Chip)
Hardware: Mountain Hardware's ROMPLUS Board

Description: Plug this ROM into your ROMPLUS board and this utility will be a keyboard command away from your immediate use. This invaluable program, made famous by Apple Computer, needs no explanation for the serious programmer. It will renumber all or part of an existing program with any size increment. It will move portions of a program within itself. It will also hide an existing program to allow another program to be loaded and reviewed or it will merge the two into one. When activated, it will not disturb any part of a program which may already be in memory.

Copies Many
Price: \$49.95 includes user documentation and ROM chip
Author: **Frank D. Chipchase**
Available: **Soft CTRL Systems**
P.O. Box 599
West Milford, NJ 07480

Name: **Address**
System: OSI C8P DF/C3 Series
Memory: 32K

Language: BASIC OS65U
Hardware: 8" floppy disk
Description: Beyond the valley of the OS-DMS address program—extremely quick access—prints labels, finds names by first or last names—DMS compatible file. Also other goodies. Write for details.

Copies Available now
Price: \$10 — your diskette;
\$20 — my diskette
Author: **Blake Etem**
Available: **Blake Etem**
Box 3, Det 4, 40th TACG
APO New York, NY 09161

Name: **6502 Cross Assembler in 8080 Language**

System: SOL or CUTER 8080 with Processor Tech Software #1
Memory: 8K

Language: 8080 Assembler
Description: Permits development of programs for KIM or other 6502 systems too small to support an assembler. Uses editor and many subroutines in the Processor Technology Software #1 self-contained system. Object code may be downloaded to KIM in paper tape or cassette format.

Copies New
Price: Write for Details
Author: **Albert S. Woodhull**
Available: **A.S. Woodhull**
RFD2 33 Enfield Rd.
Amherst, MA 01002

Name: **Board Games 1**
System: OSI C1,C2,C4,C8 BASIC-in-ROM

Memory: 8K
Language: BASIC and Machine
Hardware: None special
Description: Board Games 1 consists of two games: Cubic and Mini-Gomoku. Cubic, written in BASIC, is a game of three-dimensional tic-tac-toe, with graphics. Mini-Gomoku is a gomoku game, written in machine language, also with graphics.

Copies Just Released
Price: \$15
Author: **Terry Terrance & Danny Schwartz**
Available: **Orion Software Assoc.**
147 Main Street
Ossining, NY 10562

Name: **Appointments**
System: Apple II or Apple II Plus
Memory: 48K RAM
Language: Applesoft - 3.2.1 DOS
Hardware: Applesoft firmware card, 1 disk drive, optional printer

Description: The Appointments package allows you to create your own appointment system with user definable starting and ending times, appointment separation and entry sizes. Enter, change and erase editing with AM-PM and day to day viewing at a touch of a key. Form messages, activate-deactivate schedule dates. Full search, phone, treatment/meeting code options and many more easy to use features. For the busy professional or businessman. 7500+ appointments per disk.

Copies Just Released
Price: \$60 includes manual, tutorial program, disk.
Author: **Guy Lyle**
Available: **Audent Inc.**
1000 North Ave.
Waukegan, IL 60085

Name: **WP6502 V1.2**
System: ALL OSI
Memory: 8K Tape, 20K Disk
Language: Machine

Description: An easy to use word processing system. Editing features include line editing, Global search and replace with echo check, and ability to view text on either the screen or the printer. All commands are a single letter selected from a menu. Embedded commands include changing margins and spacing, both standard and dotted tabs, and Keyboard insertion. Blocks of text, numbered from 01 to 99, can be of unlimited length and may be inserted anywhere in the main text. WP6502 also has a unique AP feature which prevents paragraphs from being broken at the end of a page.

Copies Many
Price: \$50 Tape, \$100 Disk (5", 8" 65D or U)
Author: **Dwo Quong Fok Lok Sow**
Available: **Dwo Quong Fok Lok Sow**
23 E. 20th St.
New York, NY 10003

Name: COPY/1
System: OSI C4P
Memory: 24K
Language: Machine Code
Hardware: One minifloppy drive
Description: An efficient copier that can copy a fully loaded 40 track disk onto a blank disk with only four mountings of each disk, in two minutes from a cold start. Includes track zero, disk initializing, start and end on any tracks, multiple (0-255) copies, track/sector/page count listing following each read or write action. In full color with sound cuing. Needs no printed instructions or typed input.
Copies Just released
Price: \$20 (MD residents add 5% tax) includes diskette and mailing
Author: Hugh Tornabene
Available: Box 928
 College Park, MD 20740

Name: Recall
System: Apple II Plus
Memory: 48K
Language: Applesoft
Hardware: Apple II Plus, Disk Drive, Printer Optional
Description: An Arbitron ratings analysis package for radio stations. Compares up to four radio stations on a single display. Allows printer output and features color bar graphs. The program computes and displays audience turnover, time spent listening, audience re-cycling to day-parts, cume and quarter-hour analysis, and mutual exclusive cumes.
Price: \$750, includes manual
Author: Dr. Roger Skolnik
Available: Media Service Concepts
 Box 10682
 Chicago, Illinois 60610

Name: Drill Skill (Math)
System: Apple II
Memory: 48K (Fits 16K +)
Language: Integer BASIC
Hardware: Disk or Tape
Description: Lo-Res Educational mathematics which randomizes your questions and lets you decide the amount of permissible errors. Program is open-ended so that it can be customized and changed in its operational functions (see REM). When completed it counts correct amount vs. amount of errors.
Copies On Demand
Price: Disk \$10.95, Tape \$6.95 plus .50 s/h
Author: R. Sherman
Available: PCS Electronics
 52 Jackson Dr. So.
 Poughkeepsie, NY 12603

Name: Budget Estimator
System: Apple II or Apple II Plus, printer optional
Memory: 32K
Language: RAM or ROM Applesoft plus machine code
Description: This program allows user to estimate small business operating budgets before they are generated in detail. It is very useful for creating ballpark estimates. The program is based upon entering average pay/employee/period, # of days/period, non-labor costs # of employees/period, plus entries for extraordinary expenses. Data base can be stored on disk for future recall and comparison with 'actuals'. Supports printer with machine code formatting routines.
Price: \$24.95 includes DOS #3.3 diskette, description, plus example.
Author: Neil A. Robin
Available: Tech-Digit Co.
 21 Canterbury Lane
 Sherwood, Oregon 97140

Name: Coil Design
System: PET computer
Memory: 6K
Language: BASIC
Hardware: 1.0 or 2.0 ROM PET
Description: Design your own R.F. chokes and tank coils to a specified inductance or inductive reactance on a coil form of your choice. Coil inductance may be from 0.2 to 75 microhenries using wire sizes from #8 to #40 with a special section for tubing. Designs include using 1/2, 1, or 2 watt resistors as forms, or you may choose a form having dimensions meeting your requirements.
Copies Just released (SASE for catalog)
Price: \$3.95 ppd.
Author: Harry L. Rosier
Available: Kinetic Designs
 401 Monument Rd. #171
 Jacksonville, FL 32211

Name: FORM-DS
System: Apple II
Memory: 32K, ROM Applesoft
Language: Applesoft
Hardware: Disk
Description: FORM-DS is a system of programs and routines that assist in the entry, editing and display of data. Simplifies the use of sophisticated I/O, in your programs. Describe screen formats by simply typing them on the screen. Automatic range tests of

numeric input data. Displays edited numeric values with commas inserted, etc. Dump the text screen contents at any time to a printer. Routines are easily incorporated into Applesoft programs.
Price: \$25 includes system diskette (DOS 3.2) with sample program and documentation manual.
Author: Robert F. Zant
Available: Decision Systems
 P.O. Box 13006
 Denton, Texas 76203

Name: 'DUSC' — Disk Utility Sorted Catalog
System: Apple II, or Apple II Plus
Memory: 32K
Language: 6502 machine code
Hardware: Apple II with Disk II
Description: A machine language utility for sorting the disk catalog. Works with any version of DOS (3.1/3.2/3.2.1/3.3). Physically reorders the catalog entries on the disk into ASCII collating sequence. Fast, can sort full catalog in less than 10 seconds. Preserves delete indicator integrity and forces deleted files to sort last. Complete error handler. Interfaces to user in a manner similar to UPDATE 3.2.
Copies Just Released
Price: \$15.95 includes disk and documentation.
Author: Richard E. Rettke
Available: RER Software
 1757 Acorn Ct.
 Menasha, WI 54952

Name: Mind Bogglers I
System: Atari 400 or 800
Memory: Cassette version 16K, Disk 24K
Language: BASIC
Hardware: Atari 400 or 800 with 410 cassette recorder or 810 disk drive
Description: Consists of 3 strategy games: Capture (based on Othello™), Mystery Box and Simon Says. Capture is a strategy game in which you and your computer fight for control of the board. In Mystery Box the player shoots rays into the box to find the hidden atoms. Simon Says is a memory teaser in which you must repeat the computer's pattern.
Price: \$15.95 cassette, \$19.95 disk
Author: Gary R. See
Available: Versa Computing, Inc.
 887 Conestoga Circle
 Newbury Park, CA 91320

PDJ



DR. DOBB'S JOURNAL of COMPUTER Calisthenics & Orthodontia

Running Light Without Overbyte

Twelve Times Per Year

\$21/1 Year — \$39/2 Years

Recent issues have included:

ZX65: Simulating a Micro

EXOS-6500 Software Development Tool Kit

6502 Assembler—Pet 8K-32K

A Note on 6502 Indirect Addressing

The C Programming Language

What you see is what you get.

To subscribe, send your name and address to *Dr. Dobb's Journal*,
Department V4, Post Office Box E, Menlo Park, CA 94025.
We'll bill you.



PG

MICRO

6502 Bibliography: Part XXIX

834. Compute 1, Issue 5 (July/August, 1980)

Moshell, J.M., "Assembly Language Programming with UCSD PASCAL," pg. 52-57.

Tutorial including a program to make low-resolution 16-color graphics available to Pascal.

Victor, John, "Adding a Voice Track to Atari Programs," pg. 59-61.

Discussion and Listing for the Atari.

Fortner, Charles G., "The Basics of using POKE in Atari Graphics," pg. 62.

Discussion with a simple program and an expanded program by Robert Lock.

Harris, Neil, "Color Wheel for the Atari," pg. 64.

A simple graphics program for the Atari system.

Lindsay, Len, "Choose Your Joystick," pg. 64.

It takes only a few lines in BASIC to allow you to use whatever joystick plug you wish.

Isaacs, Larry, "Input/Output on the Atari," pg. 65-68.

A tutorial on how to use BASIC commands to communicate with your peripheral devices.

Butler, Brett, "Un-New," pg. 81.

While NEW erases a program from memory, UN-NEW will help you recover that program, by rebuilding the chain and restoring the variable pointers, for the PET.

Poirier, Rene W., "Disk ID Changer," pg. 83.

A PET listing for changing either the name or the ID number on a diskette.

Butterfield, Jim, "Shift Work," pg. 85.

Tricks with the PET's shift key.

Wollenberg, Robert H., "Machine Language Code for Appending Disk Files," pg. 86.

A useful tool for the PET DOS to help in appending programs.

Butterfield, Jim, "Mixing BASIC and Machine Language," pg. 89-90.

Put BASIC and Machine Language together on your PET, with several examples: Universal ROM Test; RAM Test; Tape Test; Leader Write.

Busdiecker, Roy, "After the Monitor's Moved," pg. 92-93.

An instructional article for the PET.

Butterfield, Jim, "Fitting Machine Language into the PET," pg. 94-95.

A tutorial article on the PET memory management.

Herman, Harvey B., "Joystick Revised," pg. 99-100.

A machine language for the PET that allows one to use joysticks, without any changes in programs.

835. The Target (July/August, 1980)

Butterfield, Jim, "Interfacing AIM BASIC," pg. 2-3.

An instructional article on marrying AIM BASIC to machine language.

Hall, Dale, "BASIC Bandaids," pg. 4.

Improvements in the AIM 65 tape loading routine.

Rathbun, Michael, "AIM Display," pg. 7.

A quick-and-dirty slow display for AIM systems not using a teletype.

Silber, Steve, "Directory," pg. 8-9.

A program for the AIM designed to inventory the contents of AIM 65 format tapes.

836. Call—A.P.P.L.E. 3 No. 6 (July/August, 1980)

Howard, Clifton M., "Directory Title Formatting," pg. 7-23.

A major directory utility for the Apple II.

Reynolds, Lee, "Types of Memory Moves," pg. 25-27.

A tutorial on moving machine language programs around in the Apple II memory.

Anson, Christopher P., "Trix to PEEK and POKE in Pascal," pg. 28-29.

A utility to allow Pascal programmers to PEEK and POKE at a location without the need for an assembly language program linked to the primary program in the Apple.

Huelsdonk, Bob, "Making BASIC Behave, Part IV," pg. 33-35.

Continuing the development of a program to enter and store data on the Apple disk.

Anon., "Converting 'Reconstruct VTOC' for Apple II Plus," pg. 35.

This useful utility for the Apple II has now been converted for use on the Apple II Plus.

Golding, Val, "A Subroutine Becomes a Program," pg. 43.

An alphabetizing program for the Apple.

DeGroat, Ron, "Inverse and Flashing Modes for Apple Pascal," pg. 46.

An assembly language listing for Pascal Users.

Golding, Val J., "Applesoft Input Nearly Anything Subroutine," pg. 47-48.

This program allows inputting a string in Applesoft which contain items like a semicolon or quotation marks.

Huntress, Wes, "Hi-Res Screen Switch," pg. 48-49.

An Apple machine language program to move a scene from one Hi-Res page to another.

Golding, Val J., "How to Have Your Cake and Eat It Too," pg. 50-52.

A group of Integer BASIC programs for the Apple.

Carner, Douglas, "Beyond Integer BASIC," pg. 52-53.

Applesoft functions duplicated in Integer BASIC for the Apple.

Boody, Charles, "Comparing Applesoft Programs for Differences," pg. 54-56.

Two listings that will assist you in ferreting out the changes that have been made in a modified program.

Flanagan, Dale, "Adding Cursor Control to Aptype," pg. 58.

Four added lines will make your Aptype program more versatile.

837. **MICRO No. 27 (August, 1980)**

Brady, Virginia Lee, "Data Statements Revisited," pg. 7-11.

The fundamentals of the technique and examples of a program to update program statements (for Applesoft). MacCluer, C.R., "Satellite Tracking with the AIM-65," pg. 13-14.

An astronomy program for the AIM 65, but easily adapted to other 6502 systems.

Chipchase, Frank D., "Better Utilization of Apple Computer Renumber and Merge Program," pg. 17-18.

Here is a technique to enhance the utility of the useful Renumber and Merge program.

Cadmus, Ray, "Variable Lister," pg. 19.

This program will extract the variable names from your Basic Apple program and sort and list them.

Golla, Lawrence R., "Nth Precision Add and Subtract with Adjusted Processor Status," pg. 27-29.

A general utility program for the 6502 family.

Partyka, David A., "Solar System Simulation With or Without an Apple II," pg. 33-39.

Apple Graphics and the laws of the universe combine to make a super demonstration.

Taylor, William L., "Interface of OSI-C1P with Heath Printer," pg. 47-51.

Hardware and Software to implement the Heath H-14 printer with OSI machines.

Motola, R.M., "Applesoft Floating Point Routines," pg. 53-55.

A discussion of some important Applesoft routines and their use.

Beamsley, Jeff, "Up From the Basement," pg. 59.

Discussion of OSI microcomputer information resources.

Finn, Kenneth, "Son of Screen Print," pg. 61-63.

A mini-word processor for the PET.

Bauers, Barton M., Jr., "Business Dollars and Sense in Applesoft," pg. 65-67.

Rounding and Formatting business data.

Soltero, Richard, "BCD Input to a 6502 Microprocessor," pg. 68-70.

A basic program for inputting data to 6502 machines like the SYM-1 or AIM-65.

Rowe, Mike (Staff), "The MICRO Software Catalog; XXIII," pg. 71-73.

Seventeen new software items for 6502 micros are reviewed.

Dial, William R., "6502 Bibliography: Part XXIII," pg. 75-77.

About 120 new references for the 6502 users.

838. **Dr. Dobb's Journal 5, Issue 7, No 47 (August, 1980)**

Kruse, Richard M., "ZX65: Simulating a Micro," pg. 4-10.

An assembly language program which simulates a 6502 using a Z-80 board.

839. **The Apple Barrel 3, No. 6 (August, 1980)**

Black, David C., "Pascal Tutorial-Lesson 2," pg. 5-8.

Continuation of a tutorial started several months ago. With several demo listings, for the Apple.

Meador, Lee "DOS Disassembly," pg. 11-16.

A continuation of this series on the DOS 3.2 for the Apple.

840. **OSI Users Independent Newsletter, No. 5 (Aug. 1980)**

Hooper, Philip K., "Command Decoding in 65D," pg. 1-2.

Discussion plus decoding table for OSI users.

Curley, Charles, "Clear and Color Screen Routine," pg. 3.

A quick screen clear routine for the OSI user.

Geoffroy, John, "File Directory Re-Creation Utility," pg. 5-6.

A program to restore zapped directories on OSI systems.

841. **The Harvest 1, No. F (August, 1980)**

Pump, Mark, "Mark Pump's DOS Patches," pg. 1-5.

Changes in DOS 3.2, 3.2.1 to allow faster INIT and other functions and lots of other useful mods.

Stadfeld, Paul, "Space Exploration," pg. 8.

All about the little known SPC function on the Apple.

Lundeen, Rich, "Character Poking," pg. 12.

Experiment with poking characters to the Apple screen.

842. **Creative Computing 6, No. 8 (August, 1980)**

McBurney, N.B. II, "Apple Pie," pg. 110-113.

Understanding pie charts and the Apple high resolution graphics in plotting charts.

Mechner, Jordan, "Translating Into Apple Integer Basic," pg. 124-125.

All about the differences between an Integer basic and floating point type basics.

Wolff, Bruno B. Jr., "Apple II: Reading Data From Tape," pg. 126-127.

A tutorial for the Apple II.

Carpenter, Chuck, "Apple Cart," pg. 148-152.

Discussion of Disk Drives, Apple III, Super-Text word processor, and a Pascal program and an integer string program.

Blank, George, "Outpost: Atari," pg. 154-156.

Differences between Atari Basic and various Microsoft Basics, Sound programs, Text Handling, Jumps and Subroutines, I/O routines, etc. on the Atari.

843. **Byte 5, No. 8 (August, 1980)**

Williams, Gregg, "The Ohio Scientific CA-15 Universal Telephone Interface," pg. 40-44.

An interface under software control that puts your OSI micro on the telephone line.

844. **Softside 2, No. 11 (August, 1980)**

Blank, George, "Converting Graphics from One Computer to Another," pg. 22-23, 88.

A comprehensive look at the graphics of the Apple, Atari and TRS-80 computers.

Smith, Bill, "ROM the ROBOT," pg. 42-44.

Part 3 of a continuing graphics program for the Apple.

Anon, "You Can Have Sound on Your Computer," pg. 66-69.

Listings for Apple, Atari and TRS-80.

845. **The Cider Press (March, 1980)**

Anon, "Disk of the Month—March '80," pg. 1.

Fourteen programs on an Apple Disk.

Bernheim, Phil, "Read Those Mysterious 'T' Files," pg. 5.

An easy way to read files on the Apple.

Pfeifer, Frank, "Notes on Disk Aide," pg. 6.
 Notes on this Useful Utility, for the Apple.

Chipchase, Frank, "Better Use of Apple II Renumber and Merge Program," pg. 7.
 Suggestions for improving the use of this Apple Utility.

Anon, "Disk of the Month," pg. 3.
 Twenty one listings on an Apple Diskette.

Anon, "Utilities," pg. 6.
 Tricks with the Parallel Printer Card for the Apple, Apple tricks with the DOS, a Gasoline price conversion program, etc.

Wozniak, Steve, "Binary-To-Decimal Shortcut," pg. 7.
 A Shortcut by one who should know his way around the Apple.

846. Robert Purser's Magazine, Edition 9 (Summer, 1980)
 Purser, Robert, "Software Directory: Apple II, TRS-80 level II, Atari."
 Reviews of programs and a comprehensive list of available software.

847. KB Microcomputing, No. 44 (August, 1980)
 RE', Ugo V., "Improving the OSI Challenger C2," pg. 40-46.
 First in a two-part series on the inner workings of OSI "500" boards.
 Pytlik, William F., "PET I/O Port Expander," pg. 96-98.
 A description of Joystick interfacing to the PET.
 Moore, Robin B., "Graphics Character Generator," pg. 106-117.
 Mix text and graphics anywhere on the Apple II screen with this CHAR-GRAF program.
 Moore, William R., "Let PET Design Your Next Power Supply," pg. 130-133.
 Make your PET an Engineer/Draftsman with this program.
 Yob, Gregory, "Get Your PET on the IEEE 488 Bus," pg. 134-140.
 This second part of the series examines the file characteristics of the IEEE 488 bus.
 Boynton, G.R., "A 'Personable' Calendar" pg. 168-171.
 Let your PET clear up confusion in your lists.

848. The Seed 2, No. 8 (August, 1980)
 Davis, William, "Empty Files," pg. 6.
 How to create an empty file designation on the Apple Catalog.
 Greene, Amos, "Renumbering Disk Volumes," pg. 9.
 A simple method to change the Volume No. on the Apple Disk.
 White, Harry C., "Russian Roulette with RND," pg. 10.
 All about Random numbers on the Apple.
 Smith, W.B., "A Shape Maker for Apple II Lo-Resolution Color Graphics," pg. 14.
 Create shapes for your games.
 Wise, Bruce, "REM Stripper," pg. 17-18.
 A routine for the Apple which removes all REM statements from a program for faster operation.
 Hance, E., "Apple Tape Beeps Translated," pg. 19.
 Explanation of those beeps on the Apple Tape format.
 Crossman, Craig, "Fun With Assembler," pg. 20-22.
 An assembly Language tutorial for the Apple II.
 Rivers, Jerry, "Sorts," pg. 23-26.
 A sorting tutorial for the Apple.

849. Interface Age 5, Issue 8 (August, 1980)
 MacDougall, John, "Put a Daisy on Your Apple," pg. 76-78.
 Describes an interface for adding a Diablo Hytype-1 or a Qume Sprint Micro 3 to the Apple System.
 Zant, R.F., "Formatting Integer Basic Programs," pg. 96-99.
 Use of Asterisks in formatting program listings.

850. River City Apple Corps Newsletter (August, 1980)
 Bartley, David H., "Rational Approximations for Floating Point Numbers," pg. 5-7.
 MAKRAT is an Applesoft program to demonstrate an ancient mathematical algorithm.

851. Southeastern Software Newsletter, Issue 20 (August, 1980)
 Staff, "Setting Character Sizes for Integral Data Printers," pg. 1-3.
 A machine language routine for the Apple.
 Staff, "Binary Converter," pg. 3-6.
 A short routine for the Apple.
 Hartley, Tim, "Tim Hartley and The Extra Catalog Track," pg. 5-7.
 Here is a short program to allow 184 file names in the Apple catalog instead of the usual 84 max.
 Hartley, Tim, "DOS Removal," pg. 5-7.
 DOS OFF is a short program for removing the DOS from any Apple Diskette, thus opening up about 6.5K extra space.
 Reich, Leo "Recovery of Apple Basic Programs after Executing 'New' " pg. 8.
 Recover from an otherwise costly error with this one.

852. PEEK(65) 1, No. 8 (August, 1980)
 Sanders, James H. "Long String Input for OSU Systems," pg. 4-5.
 A program for OSI Micros.
 Showalter, Bruce, "Cheapie Superboard II Expansion," pg. 9-14.
 A hardware article for The Superboard II user.
 Shingara, Terry, "Baud rate Mod," pg. 18.
 A Hardware Mod for OSI 600 boards.
 Badger, Robert, "Modified Garbage Collector," pg. 19-20.
 A compact version of a method of correcting string handling problems on the OSI system.
 Anon, "Card Shuffling Routine, pg. 22.

853. G.R.A.P.E. (August, 1980)
 DeGroat, Ron, "Inverse & Flashing Modes for Apple Pascal Text Display," pg. 3.
 Assembly Language Listings for Pascal.
 Anon, "Polar Function Graphs," pg. 4.
 Two demonstration listings for Apple Hi Res.

854. Abacus II 2, Issue 8 (August, 1980)
 Freeman, Larry, "Writing to Disk from a Machine Language Program," pg. 3-4.
 How to give commands such as OPEN, READ, Write, etc. from a machine language program.
 Anon, "IAC Application Note: DOS 3.2 Demo Program," pg. 8-12.
 Six programs in Applesoft.

Freeman, Larry, "The Great Applewriter Interface," pg. 13-22.

A major set of Utilities for interfacing Apple Writer and Basic Integer or Applesoft listing.

855. From the Core (August, 1980)

Budge, Joe, "Base Two User Note," pg. 4.

Using the SSM board to interface the Apple with a Base 2 printer at 19,200 Baud.

856. Personal Computing 4, No. 8 (August, 1980)

Derner, Robert R., "A Teacher for Your Apple," pg. 48-49.

A flash card type program for the Apple.

Vann, Eric Geoffrey, "A Gradebook for Teacher," pg. 53-63.

A science grading program and administrative aid, for the Apple.

Anon, "Apple III Unveiled at NCC," pg. 65-67.

Description of the latest Apple System.

857. Fort Worth Apple User Group Newsletter (FWAUG) 2, No. 1 (August, 1980)

Lyons, George, "Integer Basic Text Editor," pg. 2-7.

A simple text editor operating on text instead of code.

Neiburger, Skip, "Computer Disks," pg. 8-10.

Comparison of various brands of diskettes in copy programs, rating reliability shows marked variations.

Meador, Lee, "DOS Disassembly 7," pg. 10-15.

This installment of this important series includes the command decoder section of DOS (Apple).

858. Applesass (August/September, 1980)

Staff, "Primer of the 3.3 DOS - Meet Muffin," pg. 7.

A discussion of advantages and problems associated with the new DOS for Apple.

Anon., "One Liners," pg. 11.

Herringbone and honeycombs in Hi-Res on the Apple.

859. Rubber Apple Users Group Newsletter 3, No. 6 (August/September, 1980)

Staff, "Patch for Dakin 5 Programming Aids II," pg. 1.

A patch for Dakin 5 allowing the PATCHER to work on DOS 3.3 diskettes.

Throop, Gil, "Rapidly Transfer Data Between Arrays and Disk," pg. 2-5.

A program for the Apple.

Gabelman, Ken, "Disk Structures II," pg. 6-9.

Continuing discussion and listings for Random Data Files.

860. Stems From Apple 3, No. 8/9 (August/Sept., 1980)

Rivers, Jerry, "Technical Tidbits: The Great DOS Append Fix," pg. 12.

A fix for the Apple DOS Append and a fix for the fix.

Anon., "Dollars and Cents," pg. 16.

A formatting program for the Apple.

Evans, Frank, "Using USR," pg. 17-19.

Tutorial on the USR function for the Apple.

Apple Disk Fixer

DOS 3.2
DOS 3.3 &
LANGUAGE
SYSTEM DISK

APPLE II
32K, DISK

13 OR 16 SECTOR

If you care enough to back up critical programs and files, Disk Fixer™ will give additional peace of mind. This powerful utility for experienced Apple users is a tool kit for manipulating, repairing, and protecting all data on disk.

Use the high-speed full screen editor to examine and easily change any portion of a disk, correct space usage within files, and save money by locking out bad tracks on disks. Directories are alphabetized, if you choose.

The display and search capabilities show where specific HEX or ASCII data is located and you can modify any data including binary files.

DOS 3.2, DOS 3.3 & LANGUAGE SYSTEM DISK

Written by Jeffrey P. Garbers

1980 The Image Producers, Inc., All Rights Reserved

**IMAGE COMPUTER
PRODUCTS**

615 Academy Drive
Northbrook, IL 60062
312/564 5060

Decision
Systems

Decision Systems
P.O. Box 13006
Denton, TX 76203

SOFTWARE FOR THE APPLE II*

ISAM-DS is an integrated set of Applesoft routines that gives indexed file capabilities to your BASIC programs. Retrieve by key, partial key or sequentially. Space from deleted records is automatically reused. Capabilities and performance that match products costing twice as much.

\$50 Disk, Applesoft.

PBASIC-DS is a sophisticated preprocessor for structured BASIC. Use advanced logic constructs such as IF...ELSE..., CASE, SELECT, and many more. Develop programs for Integer or Applesoft. Enjoy the power of structured logic at a fraction of the cost of PASCAL.

\$45 Disk, Applesoft (48K, ROM or Language Card).

DSA-DS is a dis-assembler for 6502 code. Now you can easily dis-assemble any machine language program for the Apple and use the dis-assembled code directly as input to your assembler. Dis-assembles instructions and data. Produces code compatible with the S-C Assembler (version 4.0), Apple's Toolkit assembler and others.

\$25 Disk, Applesoft (32K, ROM or Language Card).

FORM-DS is a complete system for the definition of input and output forms. FORM-DS supplies the automatic checking of numeric input for acceptable range of values, automatic formatting of numeric output, and many more features.

\$25 Disk, Applesoft (32K, ROM or Language Card).

UTIL-DS is a set of routines for use with Applesoft to format numeric output, selectively clear variables (Applesoft's CLEAR gets everything), improve error handling, and interface machine language with Applesoft programs. Includes a special load routine for placing machine language routines underneath Applesoft programs.

\$25 Disk, Applesoft.

SPEED-DS is a routine to modify the statement linkage in an Applesoft program to speed its execution. Improvements of 5-20% are common. As a bonus, SPEED-DS includes machine language routines to speed string handling and reduce the need for garbage clean-up. Author: Lee Meador.

\$15 Disk, Applesoft (32K, ROM or Language Card).

(Add \$4.00 for Foreign Mail)

*Apple II is a registered trademark of the Apple Computer Co.

SPACE WAR

You're in command in **SPACE WAR!** Destroy your opponent's ship by forcing him to collide with the sun or to explode upon re-entry from hyperspace--or challenge him face-to-face with missile fire. You're in command of the speed and direction of your ship. You control the timing of your missiles. You select the game mode from five options including Reverse Gravity, and the battle begins. Accelerate to place your shots--and escape into hyperspace before your opponent comes within range. But be wary, he (or she!) may circle out of sight and reappear on the opposite side of the galaxy! (This is the classic MIT game, redesigned especially for the Apple.)



and SUPER INVASION

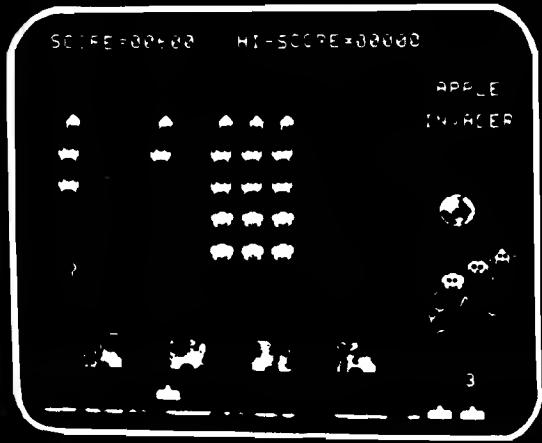
- **Super Invasion** is the original invasion game, with the original moon creatures and faster action than any other invasion game.
- Features superb high resolution graphics, nail-biting tension and hilarious antics by the moon creatures!
- Self-running "attract mode" of operation for easy learning and demonstrating of the game.
- As good in every way as the famous Invaders arcade game.
- High speed action • Sound effects!
- Runs on the Apple II and the Apple II Plus



Fifty-five aliens advance and shower you with lethal writhing electric worms. As you pick off the aliens, one-by-one, they quicken their descent. They whiz across the screen wearing away your parapets, your only defense, coming closer and closer to your level. **Super Invasion** is the **original** invasion game with the original moon creatures and faster action than any other invasion game on the market.

Super Invasion is available for only \$19.95 on cassette (CS-4006) for a 32K Apple II. **Space War** is \$14.95 on cassette (CS-4009) for a 16K Apple II. **Space War** and **Super Invasion** are on one disk (CS-4508) for a 48K Apple II for only \$29.95.

Send payment plus \$1.00 shipping and handling to Creative Computing Software, P. O. Box 789-M, Morristown, NJ 07960. NJ residents add \$1.00 sales tax. Bankcard orders may be called in toll free to 800/631-8112. In NJ call 201/540-0445.



sensational software

creative computing software

**HAS YOUR APPLE READ ANY GOOD
PROGRAMS LATELY?
APPLE II DISK SOFTWARE**

**DATA BASE MANAGER
IFO PROGRAM**

The IFO (INFORMATION FILE ORGANIZER) can be used for many applications such as: Sales Activity, Check Registers, Balance Sheets, Client/Patient Records, Laboratory Data Reduction, Prescription Information, Grade Records, Mailing Lists, A/R, Job Costing and much more. This can be accomplished without prior programming knowledge.

Up to 1,000 records with a maximum of 20 headers (categories) and 10 report formats (user defined) can be stored on a single diskette, information can be sorted on any header, both ascending and descending in alpha/numeric field. Mathematical functions can be performed on any 2 fields to manipulate the information. Information can be searched on any header using >, <, =, >, <, =, and first letter. Mailing list format provided. Fast assembly language Sort, Search and Read routines. Many error protection devices provided. Put your application program together in minutes instead of hours.

Program Diskette and Instruction Manual.....\$100
Mailing List Program and Instruction Manual.....\$40

INVENTORY PROGRAM

2 disk drives, menu-driven program. Inventory categories include: Stock#, Description, Vendor ID, Class, Location, Reorder Pt., Reorder Qty., Qty. on Hand. All records can be entered, changed, updated, deleted, or viewed. Reports can be sorted in ascending/descending order by any category. There are 7 search reports (3 automatic). Calculates \$ VALUE of inventory and YTD, MTD, and period items sold, accumulates inventory over a 13-month period. Requires a 132-column, serial/parallel printer, total turnkey operation with bootstrap diskette.

Program Diskette and Instruction Manual.....\$140

PAYROLL PACKAGE *

2 disk drives, menu-driven program. Employee history include: Name, Address #, Address #2, City, State, Zip, Federal Exemption, State Exemption, Social Security #1, Date Employed, Dept. #, Code, Employee #, Status, Marital Status, Pay Rate, OT Rate, Vacation Rate, # Vacation Hours and Pension Plan. Program can generate weekly or biweekly payroll. Prints W-2, Qtr. Report, Pay Checks, Master and Current Files. Federal and State withholding taxes are built into program. Maintains a Cash Disbursement Journal, accumulates payroll for a 53-week period. Generates numerous type of payroll reports. Allows data to be searched, sorted and edited. Prints Deduction Register and more. Maintain up to 125 Employees/Expenses for quick and easy Payroll. Numerous error protection devices provided.

Program Diskette and Instruction Manual.....\$240

*PLEASE SPECIFY STATE WHEN ORDERING

APARTMENT MANAGER

2 disk drives, menu-driven program written in assembly language and APPLESOFT II. All you will ever need to manage your apartment. Handles up to 6 buildings with a maximum of 120 units each. Complete turnkey operation. Data categories include Apt. #, Type, Tenant Name, Pets, Children, Security Deposit, Pet Deposit, Pool Deposit, Misc. Deposit, Rent Allowances, Date Moved In, Vacancy Date, Referral, Condition of Apt., Damage Amt. and Comment Line. Search, sort, enter, edit and vacate tenants. Maintains MTD and YTD rent receipts as well as complete utility reports, rent lost by vacancies. Maintains Expenses, Vacated Tenants Report and much more.

Program Diskette and Instruction Manual.....\$325

PROFESSIONAL TIME AND BILLING

2 disk drive program written in assembly language and APPLESOFT II. Completely menu driven. Maintain all billing of clients and personnel. Generates and invoices. Numerous reports based on all types of criteria. Easy data entry for Rates, Clients, and Matters. Has Search, Sort, Change (on screen editing), View and Balance Forward. If you are a Job Contractor, Attorney, Accountant, General Consultant, or anyone that needs to charge for time, this program is a must. Complete turnkey operation. Many Reports are produced to aid in the Time Analysis Process.

Program Diskette and Instruction Manual.....\$325

ALL PROGRAMS REQUIRE 48K and APPLESOFT II ON ROM OR AND APPLE II PLUS. ALL SOFTWARE IS COMPATABLE WITH PASCAL SYSTEMS. PROGRAMS RUN FROM ANY PORT OF THE COMPUTER WITH SERIAL/PARALLEL PRINTERS. REQUIRES 1 DISK DRIVE UNLESS OTHERWISE NOTED.

SEND CHECK/MONEY ORDER or C.O.D. TO:

**SOFTWARE TECHNOLOGY for COMPUTERS
P.O. BOX 428
BELMONT, MA 02178**

(OR AVAILABLE FROM YOUR LOCAL DEALER)

ADVERTISERS' INDEX

February 1981

Advertiser's Name	Page
Aardvark Technical Services.....	14
Abacus Software.....	86
Andromeda, Inc.....	41
Aurora Software Associates.....	22
Avant-Garde Creations.....	86
Beta Computer Devices.....	69
Broderbund Software.....	22
Byte Books.....	62
CJM Industries.....	16
Computers-R-Us.....	96
The Computerist, Inc.....	53, 56
Creative Computing.....	94
Datasoft, Inc.....	Inside Back Cover
Decision Systems.....	93
Dr. Daley.....	29
Dr. Dobb's Journal.....	89
D.R. Jarvis Computing.....	66
Eastern House Software.....	1
E & I Technical Services.....	22
Galaxy.....	63
M.G. Hill.....	66
Image Computer.....	80, 93
Instant Software.....	60-61
Jini Micro Systems.....	67
Lazer Systems.....	44
LJK Enterprises.....	64
MICRO Classifieds.....	64
MICRO Ink, Inc.....	46, 63, 72, 74, 81
MICRO Software.....	86
MicroSoft Consumer Products.....	Inside Front Cover
Micro Technology Unlimited.....	2, 55
Mittendorf Engineering.....	63
Nibble.....	30
Nikrom Technical Products.....	80
Ohio Scientific.....	Back Cover
OS Small Systems Journal.....	82-85
Omega Software Systems, Inc.....	69
Orion Software Associates.....	81
Pegasus Software.....	70
Perry Peripherals.....	63
Powersoft, Inc.....	72
Programma International.....	34
Progressive Computing.....	70
Rainbow Computing.....	73
RTR Software.....	86
Sirius Software.....	80, 81
Skyles Electric Works.....	48-49
Soft CTRL Systems.....	52
Software Technology for Computers.....	95
Southeastern Software.....	4
Strategic Simulations, Inc.....	20
Sunset Electronics.....	70
Versa Computing.....	62

Why Advertise in MICRO?

Find Out!

Call (617) 256-5515

Ask for Cathi Bland

"COMPUTERS 'R' US"

A CONSUMER COMPUTERS SUBSIDIARY

UNBEATABLE MAIL ORDER DISCOUNTS

apple computer
Authorized Dealer

\$925
FOR 16K

48K
FOR ONLY
\$1049

apple //

APPLE II OR APPLE II PLUS

APPLE COMPUTER PERIPHERALS

DISK II DRIVE & CONTROLLER CARD	
With DOS 3.3, List 8645	629
DISK II DRIVE & CONTROLLER card	496
DISK II DRIVE ONLY	426
GRAPHICS TABLET	656
SILENTYPE PRINTER w/int. card	616
SSM AIO SERIAL/PARALLEL kit	156
SSM AIO assembled & tested	190
SYMTEC LIGHT PEN SYSTEM	216
SYMTAC SUPER SOUND GENERATOR	226
SVA 8 INCH DISK CNTROLLER CARD	336
VERSA WRITER DIGITIZER SYSTEM	216
VIDEX VIDEOTERM 30 COLUMN CARD	316
VIDEX VIDEOTERM w/graphics ROM	306
LOBO DISK DRIVE ONLY	306
LOBO DRIVE w/controller card	496
DC HAYES MICROMODEM II	319
DAN PAYMAR lower case kit	56

APPLE COMPUTER INTERFACE CARDS

PARALLEL PRINTER Int. card	146
COMMUNICATION CARD w/conn. cable	186
HI-SPEED SERIAL HI. card	146
LANGUAGE SYSTEM with PASCAL	426
CENTRONICS PRINTER Int. card	186
APPLESOFT II FIRMWARE card	146
INTEGER BASIC FIRMWARE card	146

MOUNTAIN HARDWARE ACCESSORIES

A Division Of

Mountain Computer

APPLE CLOCK/CALENDAR card	226
SUPERALKER SD200 SPEECH	226
SYNTHIZER SYSTEM	248
ROMPLUS w/keyboard filter	186
INTROLUX-10 SSR REMOTE CONTROL SYSTEM	248
INTROLUX-10 controller card only	186
ROMWRITER SYSTEM	156
MUSIC SYSTEM/16 voices/8sf	466
A/D-D/A 16 CHANNELS	319
EXPANSION CHASSIS (8 slots)	566

VIDEO MONITORS

LEEOEX VIDEO 100	129
SANYO 9" B&W	165
SANYO 15" B&W	245
PANACOLOR 10" COLOR	329
NEC 12" HI-RES COLOR	875
NEC 12" LO-RES COLOR	399
NEC 12" GREEN PHOSPHER(P31)	239

\$129

LEEDEX
VIDEO 100



IN CALIFORNIA, OR FOR BACKORDER
OR TECHNICAL INFO CALL:

(714) 698-8088

TOLL FREE ORDER LINE: **1-800-854-6654**

CREDIT CARD USERS PLEASE READ TERMS OF SALE IN ORDERING INFORMATION

ORDERING INFORMATION: Phone Orders Invited using VISA, MASTERCARD, AMERICAN EXPRESS, or bank wire transfers. VISA & MC credit card service charge of 2%. AE credit card service charge of 5%. Mail orders may send charge card number (include expiration date), cashier's check, money order or personal check (allow 10 business days to clear.) Please include a telephone number with all orders. Foreign orders (excluding Military PO's) add 10% for shipping and all funds must be in US dollars. Shipping, handling and insurance in U.S. add 3%. California residents add 6% sales tax. Our low margins prohibit us to send COD or on account. All equipment subject to price change and availability. Equipment is new and complete with manufacturer warranty. We ship most orders within 2 days. Order desk hours are Monday thru Saturday 9-5 PST. Send for FREE 1981 Catalog.

WE ARE A MEMBER OF THE BETTER BUSINESS BUREAU AND THE CHAMBER OF COMMERCE

PLEASE SEND ORDERS TO: CONSUMER COMPUTERS MAIL ORDER DIVISION, 8314 PARKWAY DRIVE, GROSSMONT SHOPPING CENTER NORTH, LA MESA, CALIFORNIA 92041.



16K FOR \$799
ATARI 800
PERSONAL COMPUTER SYSTEM

ATARI ACCESSORIES

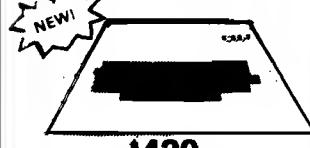
400 COMPUTER	479
820 PRINTER (40 col.)	459
810 DISK DRIVE	559
410 Program Recorder	59
815 DUAL DISK DRIVE	1199
822 THERMAL PRINTER (40 col.)	369
825 PRINTER (80 col. imp.)	795
850 INTERFACE MODULE	175
ATARI 16K RAM MODULE	155
LIGHT PEN	65
ACOUSTIC MODEM (CAT)	169
COMPUTER CHESS	35
SPACE INVADERS	19
STAR RAIDERS	49
SUPER BREAKOUT	35
3-D TIC TAC TOE	35
VIDEO EASEL	35
MUSIC COMPOSER	49



\$699

C4P

8K RAM BASIC
32x64 UPPER & LOWER CASE
256x512 GRAPHICS POINTS
PROGRAMMABLE TONES
ANALOG INPUTS
C4PMF (1 DISK DRIVE) 1599



\$429

CIP MOD II

8K RAM BASIC
8K RAM EXPANDABLE TO 32K
COLOR EXPANSION
48 LINE DISPLAY EXPANSION

PRINTERS

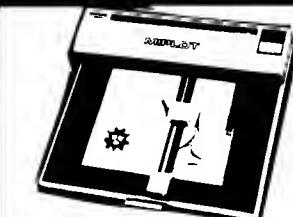
ANADEX DP-8000	775
ANADEX DP-9500	1350
BASE 2	599
CENTRONICS 737	825
MPI 88-T	699
PAPER TIGER IDS-440	
w/graphics	895
NEC SPINWRITER	2550
TRENDOM 200	519
SILENTYPE w/int.	515
EPSON TX-80 w/graphics	729
EPSON MX-80 132 col	620



SOFTWARE

	Cassette	Disk
SPACE INVADERS	19	29
SARGON II	30	35
FORTH	N/A	69
OS 85-D V3.3	N/A	79
MDMS PLANNER	N/A	100
GRAPHICS 1	N/A	35
DACI	N/A	45
ASSEMBLER/EDITOR	40	N/A
EXTENDED MONITOR	20	N/A
PASCAL & FORTRAN		450
(4P & 8P only)		
When ordering please specify system.		

PLOTTERS



\$1095

WATANABE MILOT

for more info please call or write

- FAST DELIVERY
- LOW PRICES
- COURTEOUS SERVICE
- KNOWLEDGEABLE STAFF
- LARGE VARIETY

RETAIL STORE PRICES MAY DIFFER FROM MAIL ORDER PRICES.



PAINT YOUR APPLE

And don't spare any of the 21 vibrant colors provided with Datasoft's **MICRO-PAINTER™** computer program.

MICRO-PAINTER™ is a modestly priced software package that bridges the gap between Apple hardware and the artist in us all.

Apple II* users can now heighten their creative and artistic IQs as they electronically paint extraordinary pictures.

And since the **MICRO-PAINTER™** uses state-of-the-art technology in its programming and implementation, anyone will find the program easy to use and the results — magnificent.

Children can ease their transition into a computerized society by familiarizing themselves with computer operations while they create beautiful pictures.

Hobbyists can entertain friends with colorful designs and unusual color combinations.

*Apple II is a registered trademark of Apple Computer Inc.

Businessmen can enhance demonstrations, presentations or illustrations where the emphasis is on color.

The **MICRO-PAINTER™** even magnifies images for dot-by-dot coloring, inverts colors for various color combinations and saves or displays pictures automatically.

So if you've been waiting to reveal your true artistic colors (or wishing you had more) call or write Datasoft, Inc., 16606 Schoenborn Street, Sepulveda, CA 91343, (213) 894-9154 or toll free (800) 423-5630 for details. Dealer inquiries invited.

Ask your local dealer for information on Datasoft Products.

MICRO-PAINTER



COMPUTER PAINTSET BY **Datasoft Inc.**

The home computer you thought was years away is here.



C8P DF

Ohio Scientific's top of the line personal computer, the C8P DF. This system incorporates the most advanced technology now available in standard configurations and add-on options. The C8P DF has full capabilities as a personal computer, a small business computer, a home monitoring security system and an advanced process controller.

Personal Computer Features

The C8P DF features ultra-fast program execution. The standard model is twice as fast as other personal computers such as the Apple II and PET. The computer system is available with a GT option which nearly doubles the speed again, making it comparable to high end mini-computer systems. High speed execution makes elaborate video animation possible as well as other I/O functions which until now, have not been possible. The C8P DF features Ohio Scientific's 32 x 64 character display with graphics and gaming elements for an effective resolution of 256 x 512 points and up to 16 colors. Other features for personal use include a programmable tone generator from 200 to 20KHz and an 8 bit companding digital to analog converter for music and voice output, 2-8 axis joystick interfaces, and 2-10 key pad interfaces. Hundreds of personal applications, games and educational software packages are currently available for use with the C8P DF.

Business Applications

The C8P DF utilizes full size 8" floppy disks and is compatible with Ohio Scientific's advanced small business operating system,

OS-65U and two types of information management systems, OS-MDMS and OS-DMS. The computer system comes standard with a high-speed printer interface and a modem interface. It features a full 53-key ASCII keyboard as well as 2048 character display with upper and lower case for business and word processing applications.

Home Control

The C8P DF has the most advanced home monitoring and control capabilities ever offered in a computer system. It incorporates a real time clock and a unique FOREGROUND/BACKGROUND operating system which allows the computer to function with normal BASIC programs at the same time it is monitoring external devices. The C8P DF comes standard with an AC remote control interface which allows it to control a wide range of AC appliances and lights remotely without wiring and an interface for home security systems which monitors fire, intrusion, car theft, water levels and freezer temperature, all without messy wiring. In addition, the C8P DF can accept Ohio Scientific's Votrax voice I/O board and/or Ohio Scientific's new universal telephone interface (UTI). The telephone interface connects the computer to any touch-tone or rotary dial telephone line. The computer system is able to answer calls, initiate calls and communicate via touch-tone signals, voice output or 300 baud modem signals. It can accept and decode touch-tone signals, 300 baud modem signals and record incoming voice messages.

These features collectively give the C8P DF capabilities to monitor and control home functions with almost human-like capabilities.

Process Controller

The C8P DF incorporates a real time clock, FOREGROUND/BACKGROUND operation and 16 parallel I/O lines. Additionally a universal accessory BUS connector is accessible at the back of the computer to plug in additional 48 lines of parallel I/O and/or a complete analog signal I/O board with A/D and D/A and multiplexers.

Clearly, the C8P DF beats all existing small computers in conventional specifications plus it has capabilities far beyond any other computer system on the market today.

C8P DF is an 8-slot mainframe class computer with 32K static RAM, dual 8" floppies, and several open slots for expansion.

Prices start at under \$3,000.

Computers come with keyboards and floppies where specified. Other equipment shown is optional.

For literature and the name of your local dealer, CALL 1-800-321-6850 TOLL FREE.

OHIO SCIENTIFIC

a **MACOM** Company

1333 SOUTH CHILLICOTHE ROAD
AURORA, OH 44202 • (216) 831-5600